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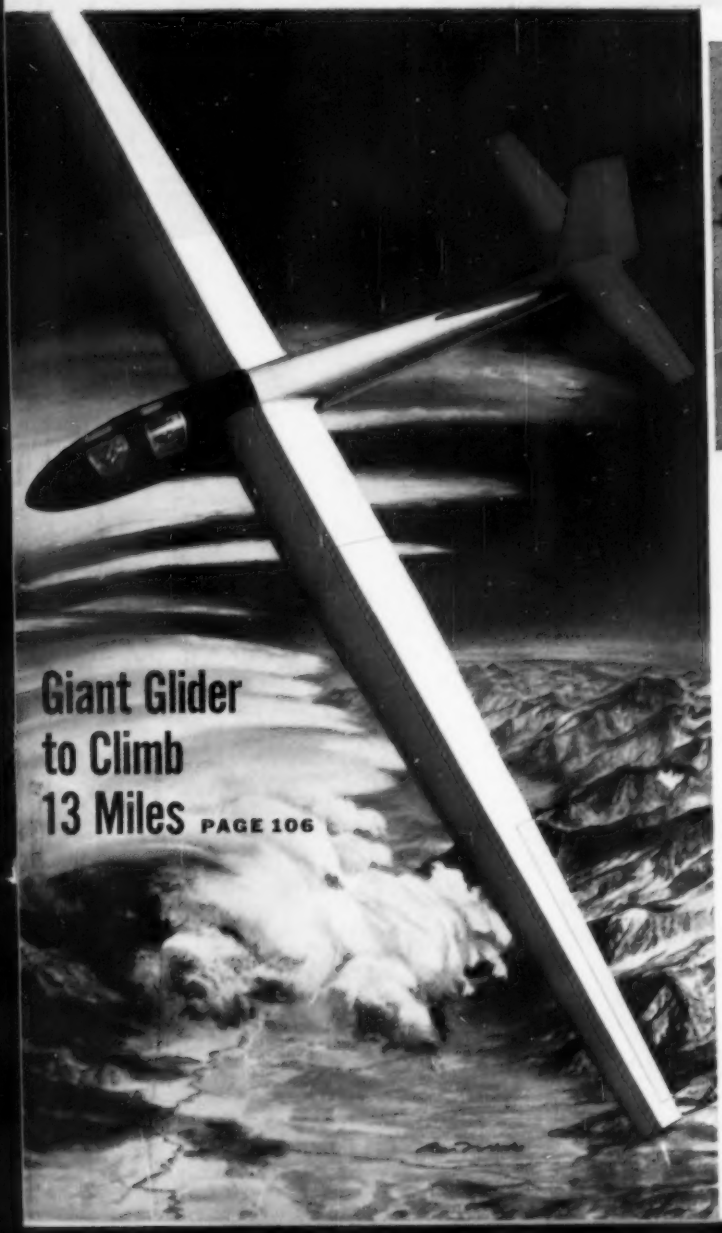
November 35c MONTHLY



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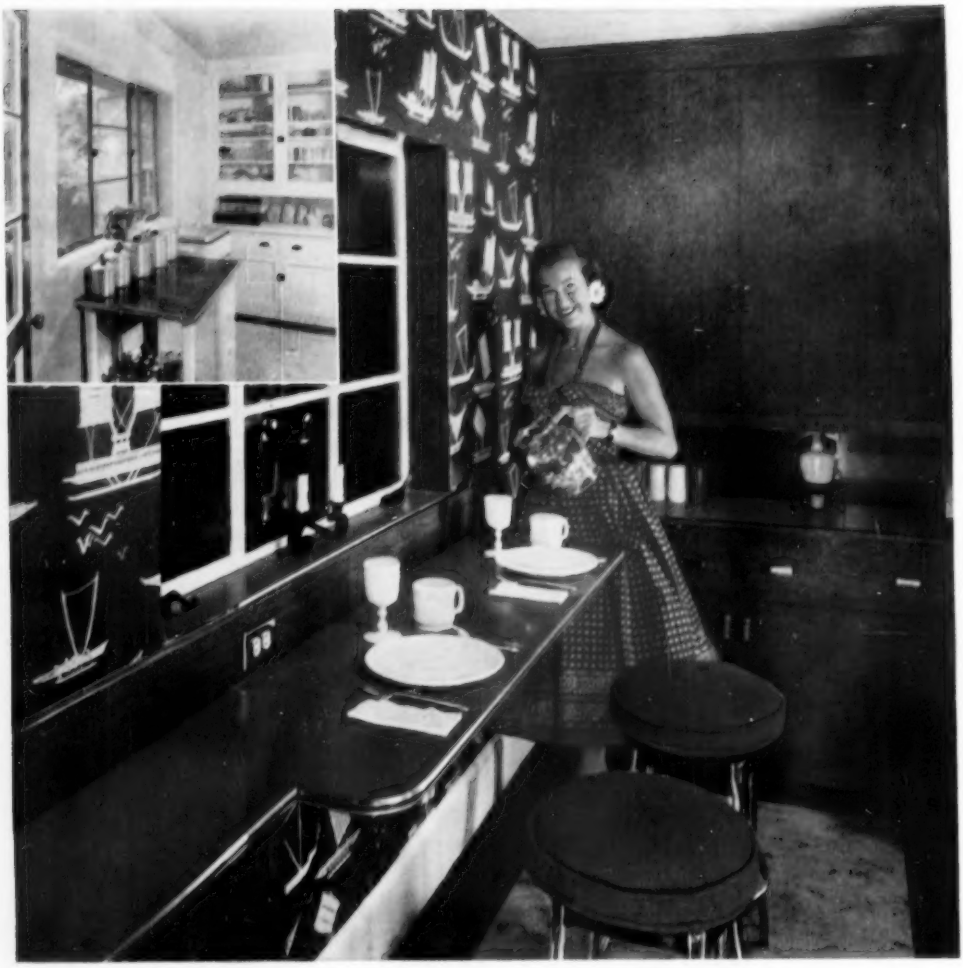

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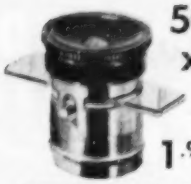

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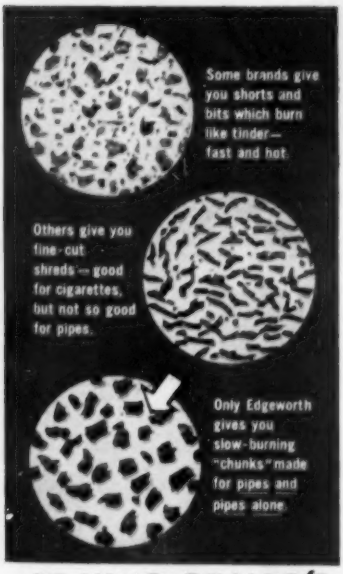

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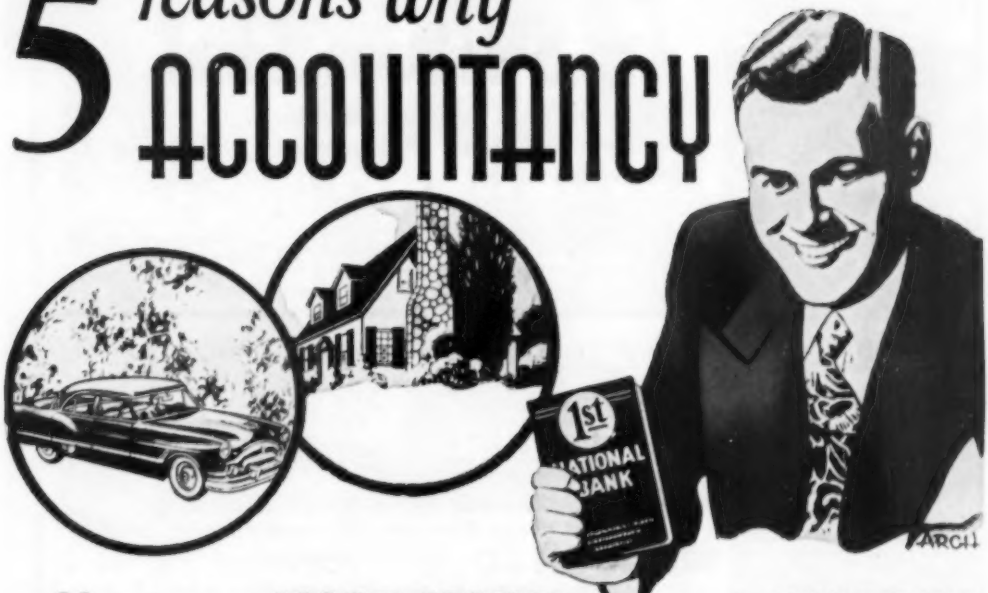

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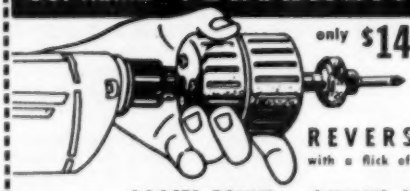

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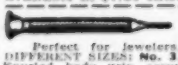

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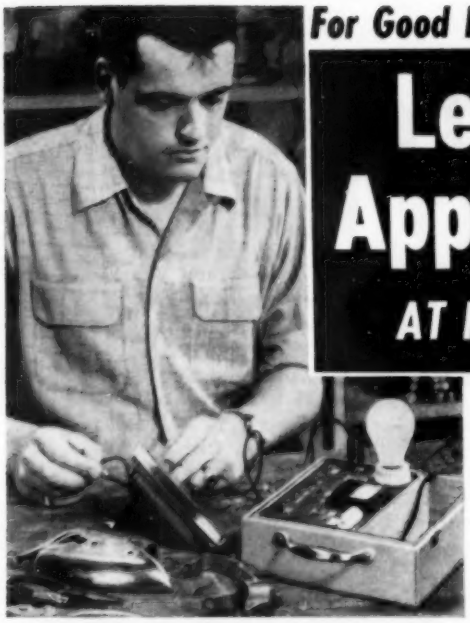

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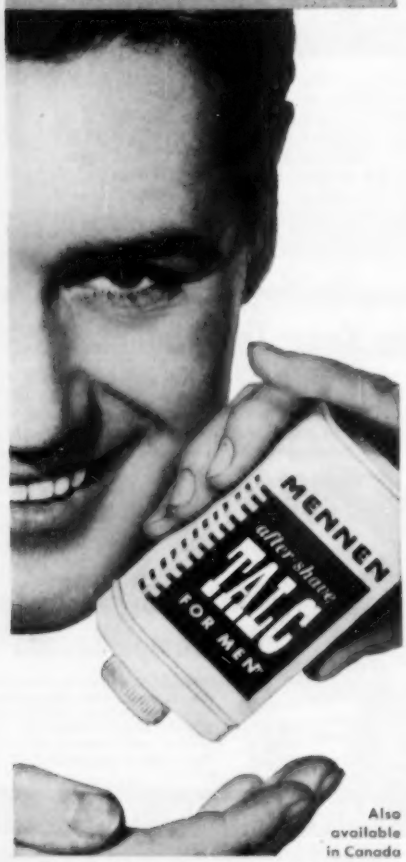

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Well, sir, I see by POPULAR SCIENCE that the brake pedal is going the way of the clutch, the stick shift and the tire tube. If Stanley Hemphill has his way ["Out Goes the Brake Pedal," Sept., p. 121], there'll be only one lever jutting out from the floor.

Now all we have to do is get rid of that poor lone pedal. Then we can all stick our

feet out forward (the windshield will push out automatically) and cool our tootsies. And that'll mean an even bigger saving: Cars of the future won't need air conditioning!

J. BEVIN, West Hempstead, N. Y.

U.S. Tells the World—Through PSM

We would greatly appreciate permission to reprint the article "Atomic Power Plant to Serve New York" [Aug., p. 82]. With your permission, reprints will be sent to our information offices in 81 countries for distribution, translation and possible republication in the foreign press.

WILLIAM E. HUTCHINSON JR.
Chief, News and Features Branch
U.S. Information Agency

PSM is naturally proud to let our Government use this story, as we have many others, to tell people abroad of American progress in the peaceful use of atomic energy.

He Peeked at GM's V-6

What's this about General Motors' V-6 engine being a deep, dark secret ["Will Detroit Build V-6 Cars?" Aug., p. 65]? Maybe you weren't allowed to look at it, but I saw

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

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it and nobody even asked for my serial number.

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JOHN J. KLINKO
U.S. Navy Patrol Sqdn. 19, San Francisco

Help for Papa

Some help, please. With Jim, my nine-year-old son supervising, I built that control-line model plane in your August issue [p. 189]. The idea was that I'd build it for him and teach him how to fly it, and then maybe after some practice he could make out on his own. Hunh!

Well, I smashed it into bits the first time out. It didn't even get around the circle once. I spent all one Saturday morning regluing it,

and then smashed it into pieces again. Jim glued it himself the next time. The only successful flights we've had have been with him at the controls.

This is not good for my reputation. Have you got any tips?

JAMES H. WARREN, Boston

Most fathers will sympathize with Jim Sr.; kids just naturally have faster reflexes than grownups. If the crashes come from too much speed, increase the size of the spoiler disk on the prop, or set the engine extra rich, or wedge a wooden match in the venturi to choke it down. If the trouble is over-controlling, use a smaller control handle or rework the bell crank for less elevator sensitivity.

Who Has the Toughest Woodpeckers?

Those pileated woodpeckers that chew up light poles [Sept., p. 163] are just Eastern dudes. If you want to see woodpeckers with bills of carbon steel, come down here to Oklahoma. A few years ago an industrial plant nearby closed up, but left its iron smokestack

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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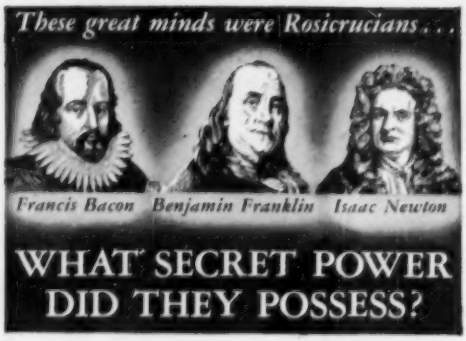

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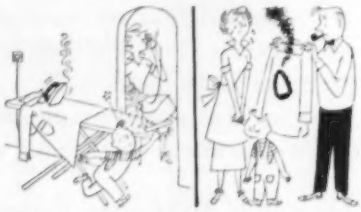
standing. That stack is now pecked full of holes one to three inches across.

DAVID J. EDWARDS, Calvin, Okla.

Wordless Gremlins in the Workshop

In Doty's cartoon [Nov., '54, p. 230], how come the hole in the shirt got burned with the point toward the collar? The previous



drawing showed the iron pointing in the other direction.

OSCAR C. TRUEBLOOD, Ames, Iowa

This blooper can only be laid to an excess of artistic license.

They Like Their Fire-Engine Copters

Thank you very much for sending us the original art work of your August cover [it showed a Bell helicopter fighting a forest fire]. It is a beautiful painting and we are now having it framed to hang in our lobby.

JAMES C. FULLER
Public Relations Director
Bell Aircraft Corp., Fort Worth

More Light on Lighting

In your September issue is an article on building a fluorescent light behind a window cornice [p. 106]. It's a good idea, and I would like to build one, but what is meant by a "feed-through switch"? Also, I would like to know if there is any simple way of locating an electrical wire and snaking it through a small hole in an outside plaster wall after I have attached it to an attic cable. I want to avoid dangling wires from regular outlets in my living room.

A. M. MORONEY, Minneapolis

A feed-through switch has the power cord running right through it. It is available in the dime stores for lamps. As for your wall problem, you can locate a wire within a few inches by measurement from a room partition that you can spot from the attic. Tie a weighted string to the cable, drop the weight through a hole in the wall plate, drill the plaster and fish for it. The string acts as a leader to the wire.

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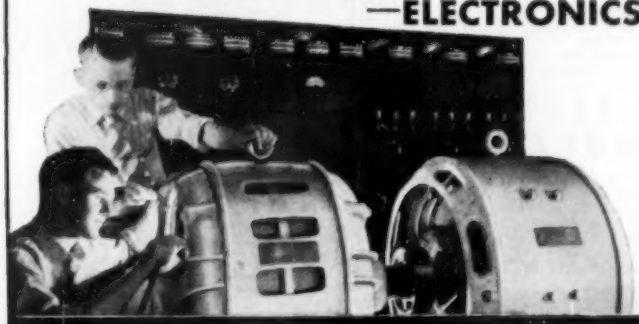

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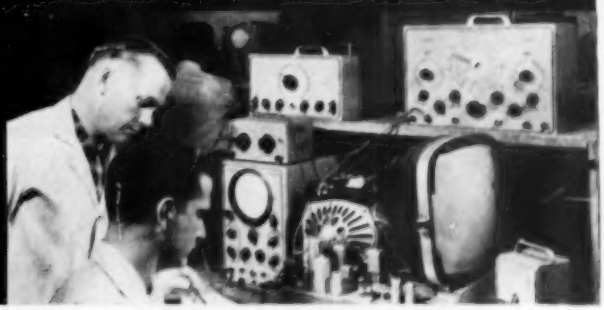
(Right — Instructor helping students check the wiring and trace circuits of television receivers.)



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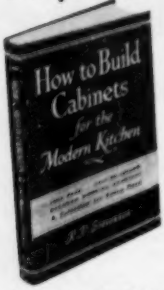

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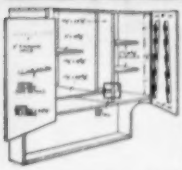

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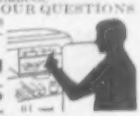

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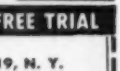

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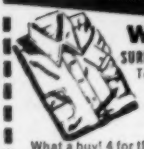

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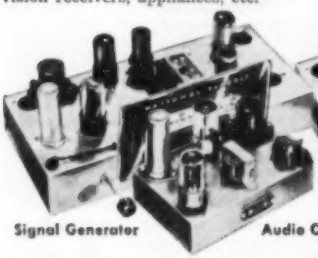
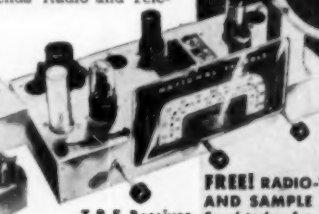


Signal Generator



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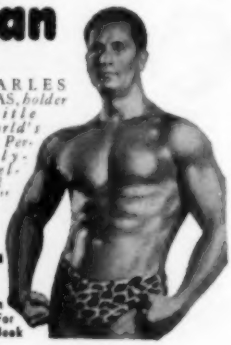

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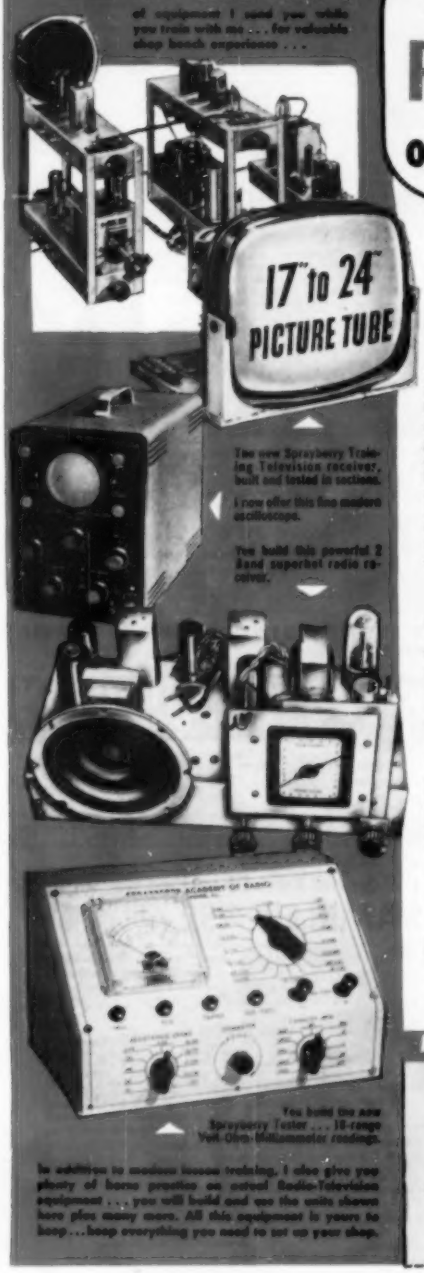

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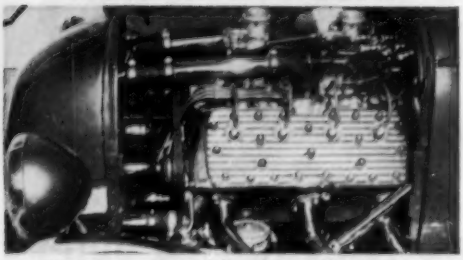

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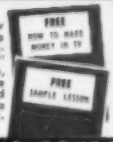

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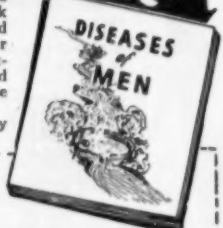

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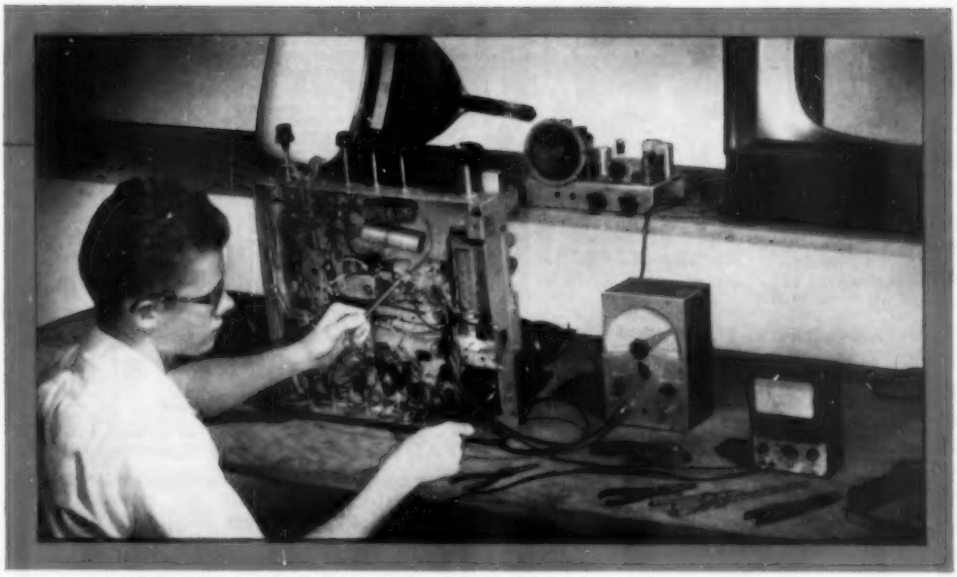

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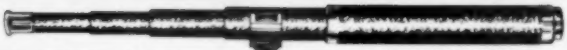

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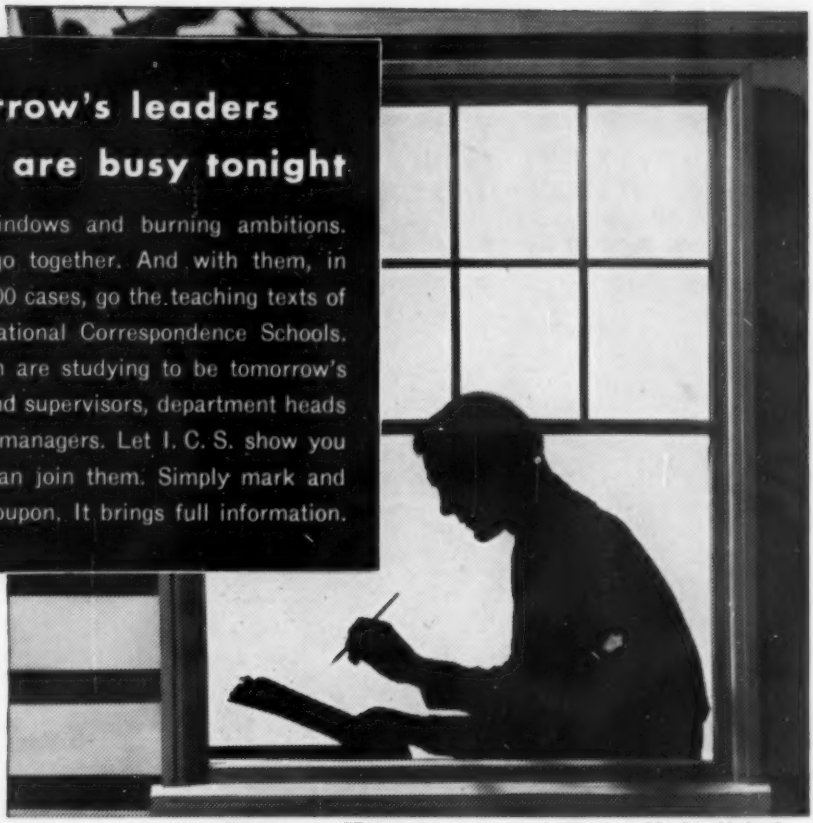

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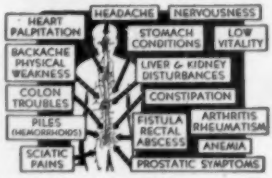

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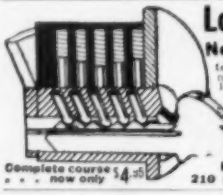

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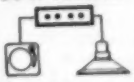

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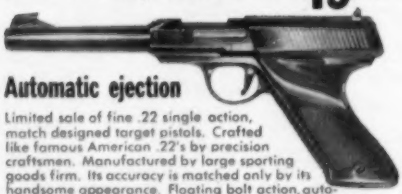

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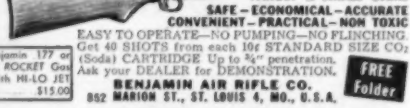

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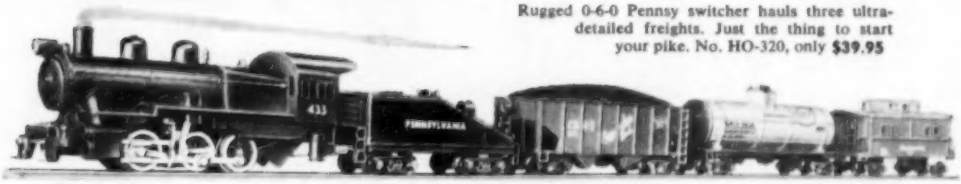

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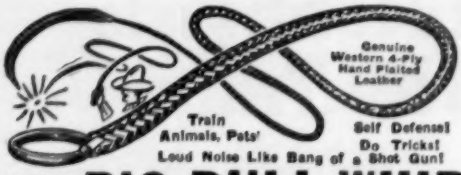

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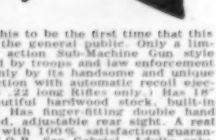

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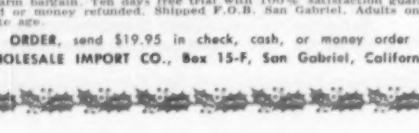

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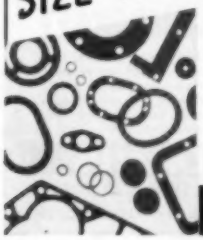

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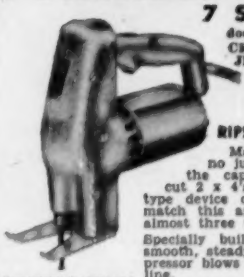

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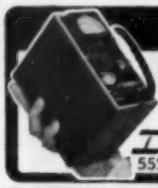

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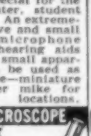

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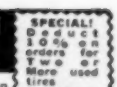

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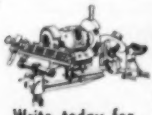

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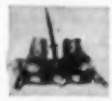

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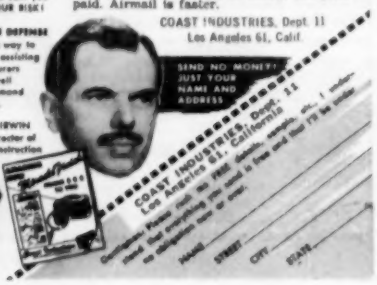

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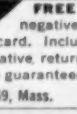

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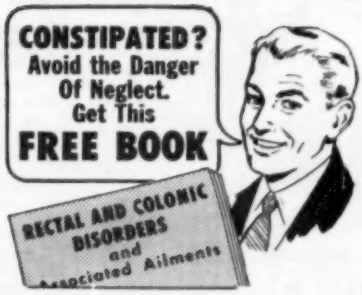

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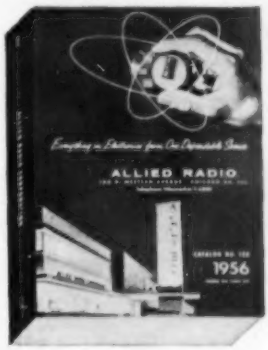

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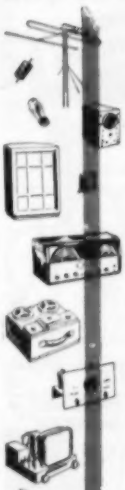

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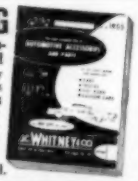

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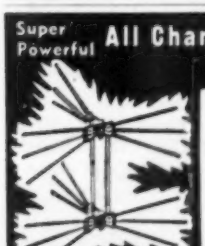

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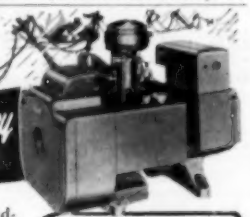

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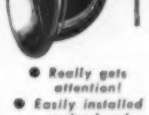

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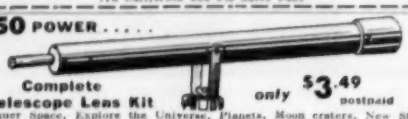

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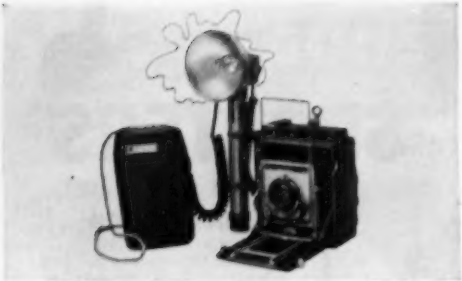

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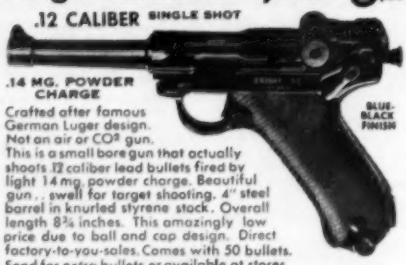

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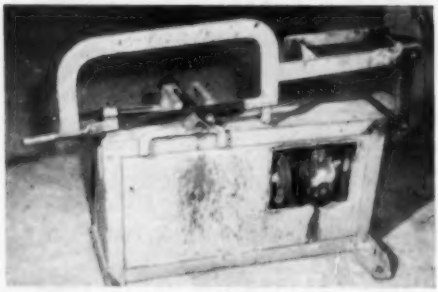

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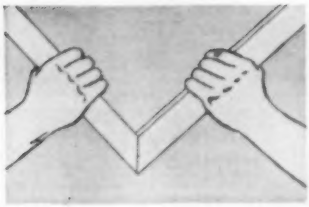

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Here's the easy way to "tame wild grain" on fir plywood stain jobs . . . and get the appearance of expensive woods. Start with a base coat of *Clear* Firzite®! Subdues wavy grain. Helps end grain raise and checking. For oak, walnut, or mahogany stains, add colors-in-oil.

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Blond, pickled or wiped effects are really popular. Get them easily on any kind of wood, without a "painty" or artificial look — with *White* Firzite. It brings out the handsome "woodsy" quality. For tinted effects add colors-in-oil. (On soft wood or fir plywood paint jobs, *White* Firzite as an undercoater helps prevent grain raise and checking.)

Quick Way to Accent Natural Beauty of all Woods!

Apply Satinlac® for a rich satiny effect which wears well and is easily maintained. The full beauty of the wood grain is accentuated and protected! Won't discolor with age. Dries so quickly, it's ready for the next coat in 3 or 4 hours.

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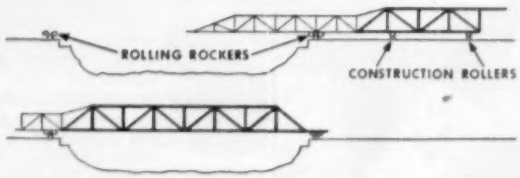
POPULAR SCIENCE MONTHLY'S . . . Last-minute news & notes

DENTISTS OF THE FUTURE MAY FREEZE YOUR MOUTH BEFORE THEY FILL YOUR CAVITIES. Dr. Robert J. Eustice of Biloxi, Miss., reports successful use of a cold air stream as a local anesthetic. (Dermatologists have been using a cold spray to anesthetize skin during operations for several years, are now experimenting with the refrigerant Freon.)...ULTRASONICS MAY CURE KIDNEY STONES, a report from Yale says. Doctors are working on a way of breaking up the stones, without surgery, using high-frequency sound vibrations.

JEEPS MAY HIT THE DRAG STRIP SOON, Detroit rumor says. The word is that Willys will bring out a hot-rod job in full, fancy colors...ALL-BLACK CARS WILL COME BACK IN FAVOR, predicts R.C. Somerville, Dodge vice-president. But they'll have "shocking" color accessories and interior trim...CAR OWNERS WILL MAKE THEIR OWN BODY REPAIRS ON PLASTIC CARS OF THE FUTURE, plastics expert Stanley S. Wulc told the Society of Automotive Engineers. Repairs, even after serious collisions, will be do-it-yourself jobs.

ENGINEERS ARE NOW "LAUNCHING" BRIDGES. In a system developed by U.S. Steel, bridges are assembled on one side of a river and rolled over by means of a "launching nose." Sections of the bridge are bolted to the nose, which is pushed across (upper drawing, left) until it engages rollers on the opposite side. When the whole bridge is across (lower drawing), the nose is detached to be used again...THE WORLD'S TELEVISION STATIONS HAVE TRIPLED IN NUMBER IN THE LAST TWO YEARS. There are now 570 stations in 38 countries.

New Method Rolls Out the Bridges



LIGHT FROM A SINGLE FIREFLY MAY BE ENOUGH TO SNAP PICTURES BY SOME DAY, predicts Kodak vice-president Donald McMaster. Film speeds, getting faster all the time, may reach that point in 75 years...NEW SPECIES OF PLANTS, CREATED BY ATOMIC RADIATION, MAY HELP FEED A HUNGRY WORLD, two Swedish scientists say. Radiation can induce beneficial hereditary changes.

spectacular beauty... dazzling performance the fabulous new Evinrude *Lark*

CHALLENGING NEW CONCEPT in outboard design . . . the Evinrude Lark . . . headliner for '56! A truly custom motor that lends added distinction to the handsomest runabout. Crisp, dynamic lines that plainly proclaim superb performance . . . *and it's there!* At your finger tips. Breath-taking getaway when you give the word to 30 tautly eager horsepower. *Commanding* power so wonderfully quiet and smooth that riding is like sailing. *Obedient* power that spins to life at the touch of a button. And *thrifty* power as well . . . with the new Cruis-Throttle that gives you up to 20% more miles per gallon. See your Evinrude Dealer—look for his name under "Outboard Motors" in your phone book. For free catalog, write **EVINRUDE MOTORS,** 4135 North 27th Street, Milwaukee 16, Wisconsin.

free! Big, full-color catalog of the complete Evinrude line for 1956. Now *nine* great models with smooth, quiet Whispering Power. Three brilliant "Thirties." New electric starting Fastwin. New Fisherman and Sportwin. With revolutionary new Eas-A-Matic starting on five models! Write for catalog today!

A Division of Outboard, Marine and Mfg. Co.
In Canada: Mfd. by Evinrude Motors, Peterborough

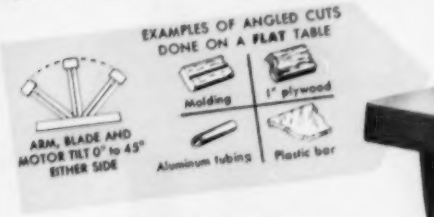
Evinrude
Pioneers in quiet Outboard Motors

NEW 1956 MODEL

POWER TOOLS

CRISP DESIGN . . MORE EFFICIENCY . . MODERN COLOR STYLING

See these 1956 advance models of America's most modern line of power tools at your hardware now. Write for Free Syncro Power Tool Catalog, Sanding Handbook.



SYNCRO POWER UNITS GUARANTEED AGAINST BURN OUT DURING YOUR OWNERSHIP OR REPLACED FREE!

ANNOUNCING THE ONLY TILTING ARBOR JIG SAW

Now . . . all others are old fashioned! Because, on new Syncro model 2500, your work remains flat while making angled cuts. Blade, arm and motor tilt together 0° to 45° to either side. Just "dial" for angled cuts. Modernize your shop with the *only* tilt arbor jig saw! Comes ready to use —no bolting down. 65 lbs., cast semi-steel. 20-in. throat, 180 sq. in. table. Use heavy duty "2500" for big projects. See at hardwares, write for catalog, price.

Precision-ground table is always level for greater control — easier, more accurate sawing . . .

AMERICA'S ONLY *MULTI-MOTION SANDERS

MODEL 900-D and 900

**Almost all wood grain is naturally crooked and irregular. Only Syncro exclusive "Multi-Motion" sanding pad action can sand with such grain and completely finish the whole surface.*

Model 900-D DeLuxe Sander Kit
Heavy duty sander. Outsands, outlasts others. Easy to handle. No "jumping". With metal case, polish pad, 48 assorted sandpapers. *Model 900 Heavy Duty Sander* comes without sight-saving work lamp or metal case.

Model 504 Finish Sander Kit
Light. Powerful. Easiest for vertical use. In metal case, sandpapers, polish pad.

MODEL 504

Model 208

Family Jig Saw
Basic power tool for Dad! Safest for children. Full 15" throat. 10" x 10" table. For projects and recreation.

Remember: More Syncro-made jig saws sold than any other self-powered make!

Don't buy trouble — buy

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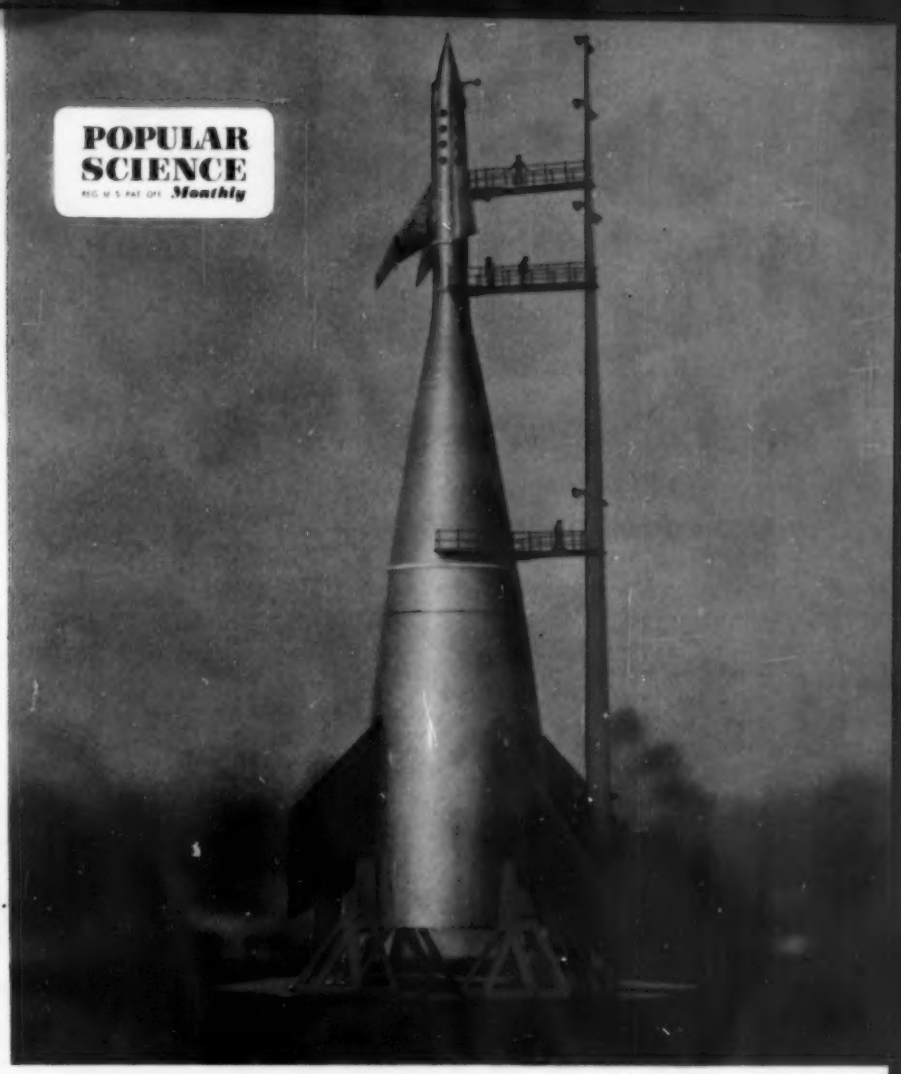
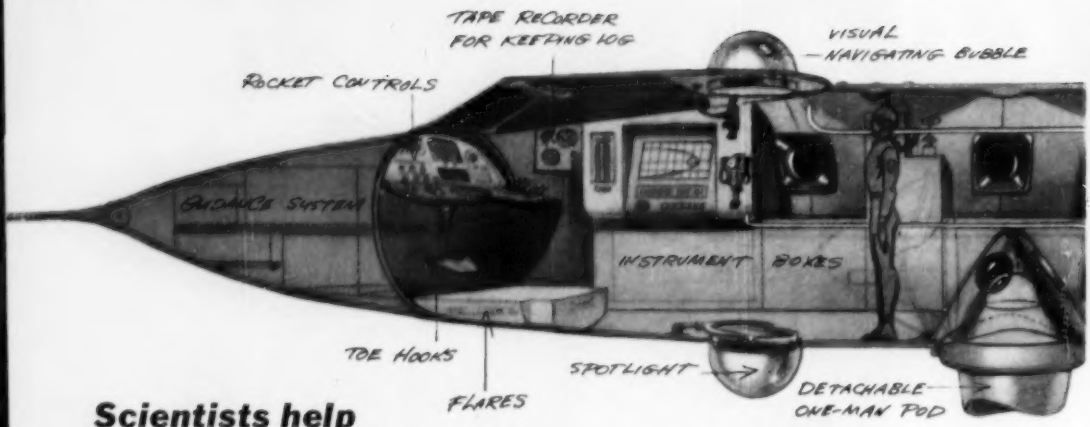


Disney Plans TV Trip to the Moon

FAR bigger and more elaborate than the "flying basketball" with which the U.S. plans to dip its toe into outer space a couple of years from now, is the space station from which Walt Disney intends to take his TV watchers on an inspection trip to the moon some Wednesday evening in December. The "Disneyland" (ABC-TV) program that night will be called "Man and the Moon." It will consist of a film with both live action and

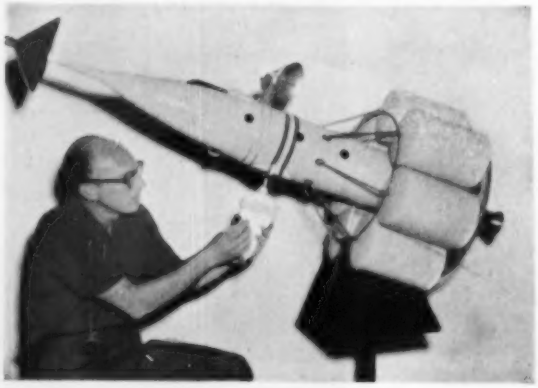


Scientists help artists design spaceship

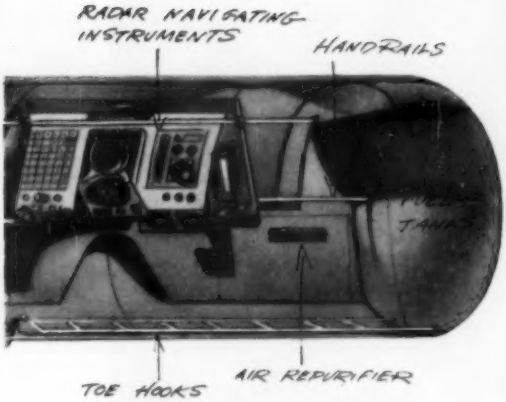
Rocket dreamed up for Disney's TV show

animation, and its theme will be an imaginary, two-stage journey to within 60 miles of our biggest natural satellite, customarily 240,000 miles away.

The imagination will be based on a high degree of probability, for Dr. Wernher von Braun, chief of the Guided Missile Development Division of the Army's Red Stone Arsenal, and rocket experts Dr. Heinz Haber and Willy Ley were technical advisers for "Man and the Moon." Scenes pertaining to the filming are shown here.—*Wesley S. Griswold.*



No-gravity is a problem (below) as a man is stuffed into a detachable pod (above) for



would be 53 feet long and carry four men.

a side trip to the permanent space station.

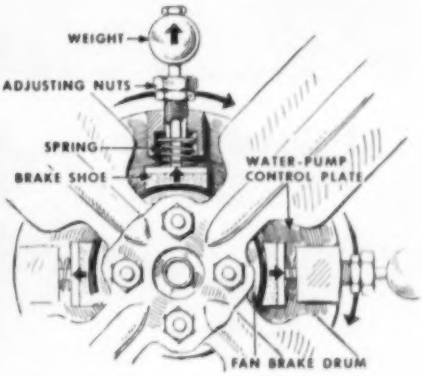
THE SPACE STATION, shown in the model below, is wheel-shaped, 200 feet across, and houses 50 men. Small rocket motors set it twirling slowly to create artificial gravity inside.

Part-Time Fan Cuts Car Noise

SOME 400 Midwest motorists are driving around these days in cars whose fans have been doctored to shut off when they get up to a speed of around 40 m.p.h.

The doctoring was done by a Franklin, Ind., car dealer and mechanic, Pete Keeling, who gets his patented Kee-Darr fan cutouts made by a local machine shop and installs them himself at a total cost of about $40.

At highway speeds, Keeling explains, enough air blows through a



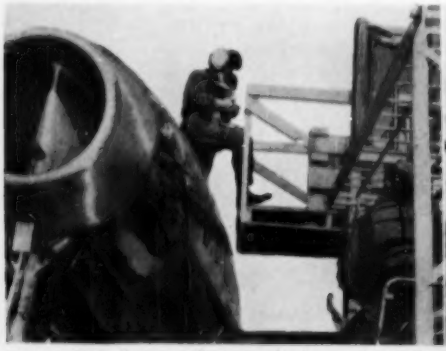
car's radiator to keep the engine cool, so long as the water pump keeps going. Keeping the fan chewing at the air stream only wastes gas and makes unnecessary noise.

Keeling's kit, which fits most 1954 and '55 cars, disconnects the fan when the engine hits 2,000 r.p.m. (about 40 m.p.h.), but keeps it spinning at slower speeds. The fan blades are attached to a brake drum that can spin free on the water-pump shaft. Fastened to the shaft is a control plate carrying four brake shoes. At low speeds the shoes grip the drum, and the fan turns with the pump. At high speeds, centrifugal force pulls the brake shoes outward, releasing the fan—and, Keeling says, saving six to 16 hp.

Pilots Play Tag with Atomic Clouds

FLYING through atomic clouds is the awesome job of a group of pilots and crewmen of the Air Force Special Weapons Center in New Mexico. Minutes after a test bomb explodes, a jet whams through the mushroom's cap to trap radioactive samples for study by scientists. As the mushroom disperses, a C-47 buzzes by at 500 feet to measure ground fallout levels. Next, "cloud hunters" in bombers head upstairs to track the drifting nuclear cloud and warn the test center if the mass begins moving toward airline routes or cities.

Men in the sampling planes pick up more radiation than trackers because they must fly through the atomic cloud itself. But even this exposure is far below the allowed limit and a post-flight shower washes away any lingering contamination.



GIANT STEP, from cockpit to platform of a fork-lift truck, keeps pilot from touching radioactive skin of plane after flight. Truck backs off before lowering the pilot to the ground.

HOT PLANE gets cooled off as ground crews in protective clothing hose it down with special decontamination spray. After 24 hours on the ramp, the craft is again safe for flying.

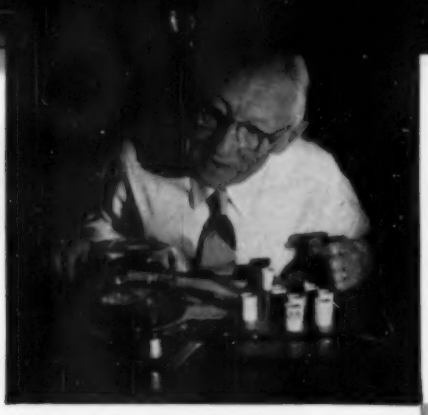
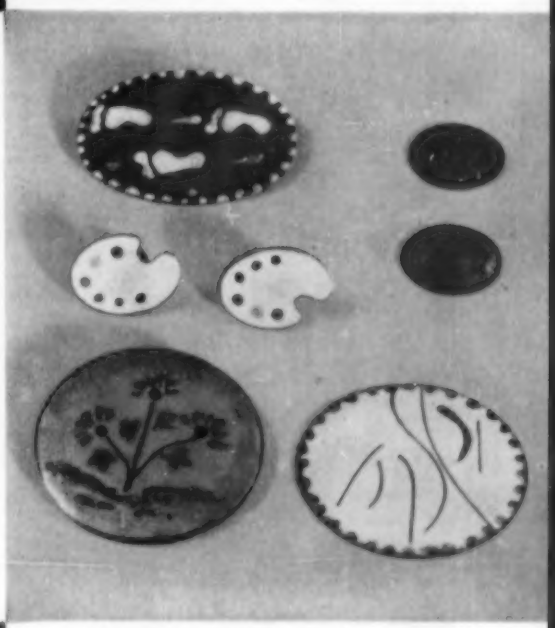


Table Kiln Fires Enamel On Jewelry

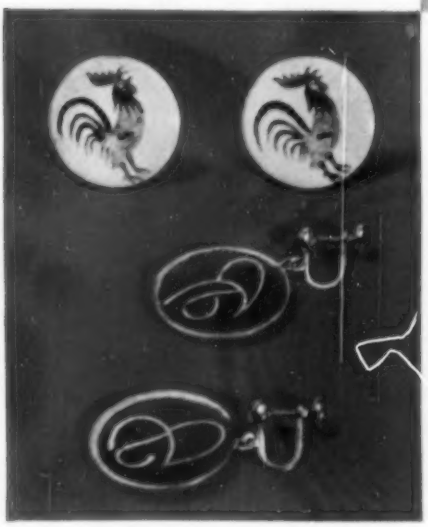
AN EXPERT made the enameled pieces in one of these photos, a beginner those in the other picture. Can you tell which is which?

Such speedy skill is made possible by a small, portable, glass-domed kiln that plugs into any electric outlet and might be taken for a coffee pot if you didn't look twice. Because you can actually see the enamels fuse during the firing, mistakes are quickly corrected, and a beginner can soon learn to turn out professional-looking enameled pieces.

The "kitchen-table" kiln is made by The Craftint Mfg. Co., 1615 Collamer Ave., Cleveland, Ohio, and sells for about $8.



GLASS-HARD BEAUTY results from fusing powdered enamels on a copper or silver base under heat. The striking earrings and brooches above are the first pieces fired by Mrs. Elizabeth Wagner of White Plains, N.Y. You can draw your own designs or trace them. Pleasing random effects are made by dusting on different colors or fusing glass threads or beads into a coating of cement which holds them in place.

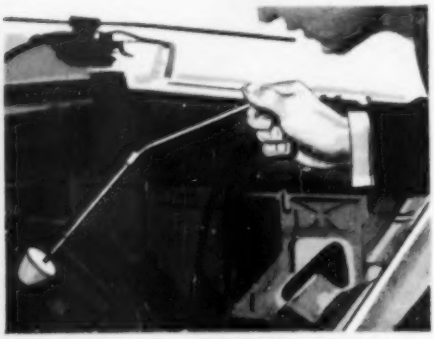


ENAMELED PIECES make excellent gifts as well as hobby projects. Blanks of various shapes for tie clips, cuff links, earrings and other jewelry can be bought ready to enamel, or you can cut your own from sheet metal. A kit including kiln, blanks, enamels and tools is available for about $15. Earrings at left were made by A. H. Edgerton, expert craftsman and inventor of the kiln.

I'd Like to see them make...

A TYPEWRITER WITH A BUILT-IN DRAWER or with a box having a lift-up lid fitted to one side. It would be handy for pencils and erasers. —*Mrs. Edith Pritchard, Los Angeles.*

BED SPRINGS THAT FOLD IN HALF. It would be easier to move them through doorways, into narrow halls, or around sharp bends in stairways.—*Mrs. R. Darnell, Rockford, Ill.*

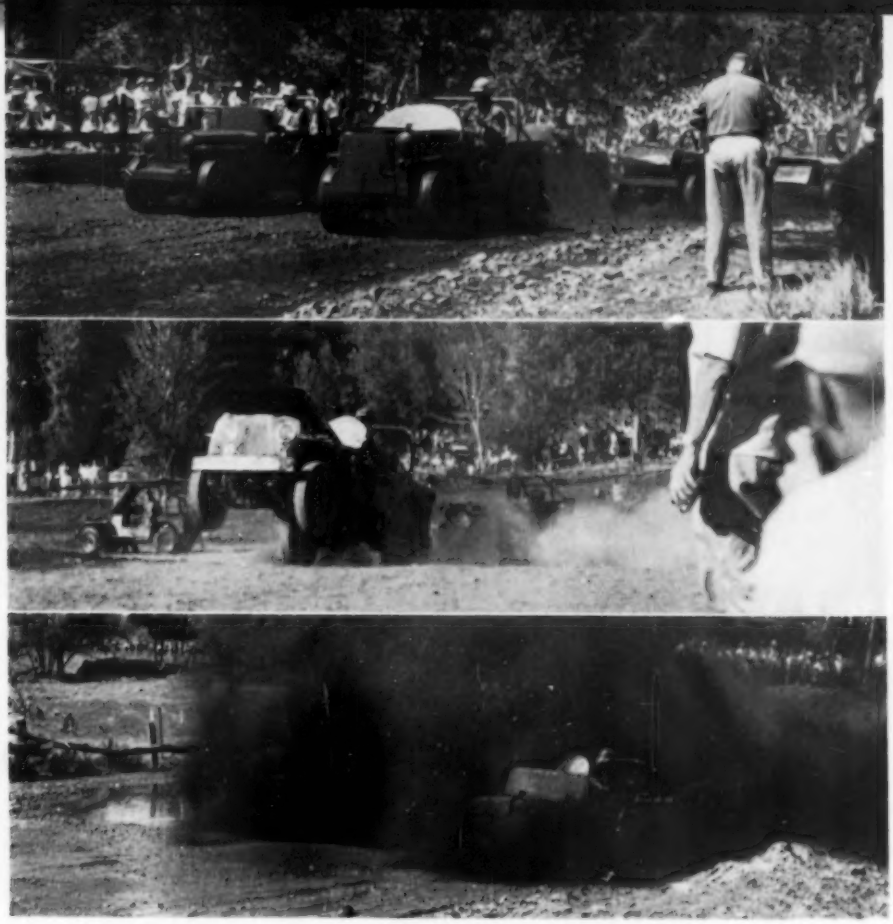


FUNNEL-SHAPED DIP-STICK HOLDERS on cars. A flaring tube end would make it easy to replace the oil stick without blind fumbling and poking around.—*R. C. Knox, Tulelake, Calif.*

A HOT-PLATE TURNTABLE on electric mixers. You'd switch it on when cooking foods that need constant stirring, such as lemon-pie filling.—*John Bainbridge, Old Forge, Pa.*

BACK-ZIPPERED BABY SHOES. They'd go on easier and require no lacing—a real chore when you're working with a squirming youngster.—*H. Neibert, Davenport, Iowa.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five illustrated above were suggested by POPULAR SCIENCE MONTHLY readers. What is *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.



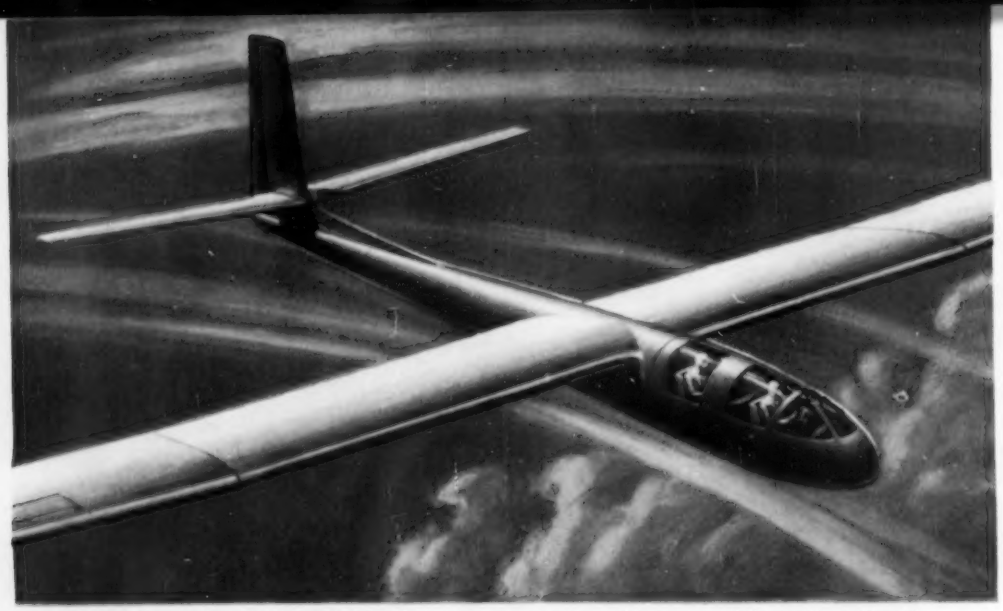
Mud Flies in Jeep Jamboree

RACING war-surplus jeeps through mud and rough stuff is the sport of 40 Yakima (Wash.) Ridgerunners. Ex-G.I.s started the club five years ago.

At their third annual Jeep Roadeo (above), contestants start off two abreast through the mud, fly through the air in a broad jump, and plow fender-deep into a water splash. Modified engines have split exhaust headers, are bored out .80", ported and relieved; fitted with semi- or ¾-race cams. Compression: 7.5-8.5 to one.

WINNER OF MUD RACE grins wearily through several layers of muck after a grueling event.

LOSER OF JALOPY RACE also loses his car when it gets shoved over a cliff in the finale.



WINGS LONGER THAN AN AIRLINER'S are proposed for big space glider. It would be built stronger than the average fighter plane. Detachable cabin (shown in cutaway at right above)

Giant Glider to

Scientists plan to float in space for hours in an engineless craft. They'll get up there riding a treacherous wave of mountain wind.

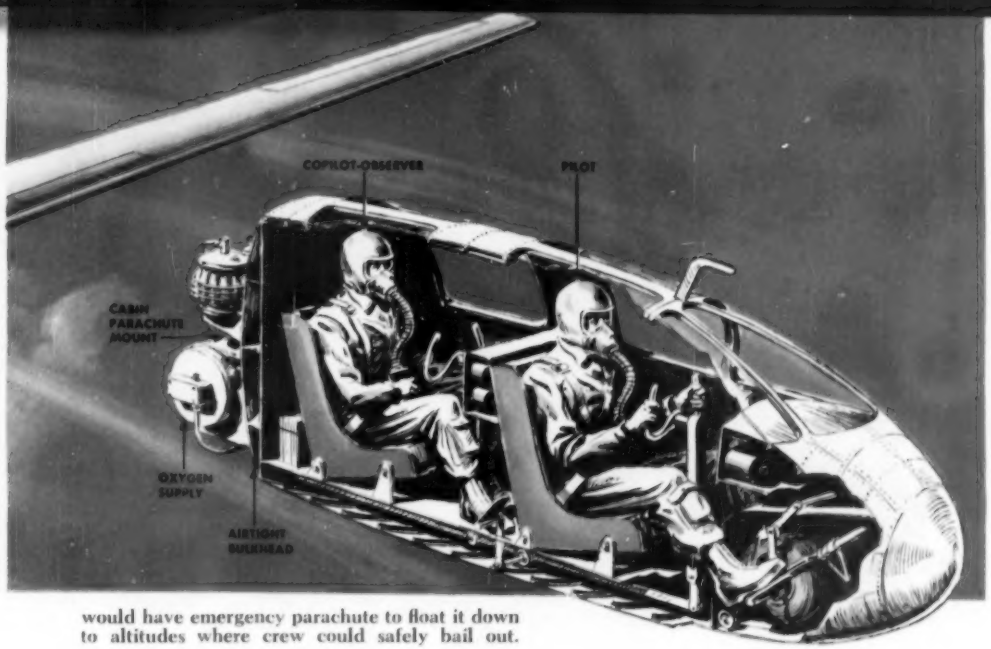
THE new way to explore space is in a glider. Conventional airplanes can't fly high enough; rockets run out of fuel in a few seconds; balloons are difficult to control.

But big, rugged gliders, riding a remarkable wind that blows upward to great heights, could soar for hours on the edge of space more than 13 miles above the earth. This is miles above the practical ceiling for airplanes, whose engines need air to operate.

Such a space glider may be built by the Air Force. Plans for a giant sailplane—a hefty craft stronger than most fighters, with a two-man detachable cabin and wings longer than those on a DC-7 passenger liner—have been prepared for the air arm's Geophysics Research Division. The ship was designed by a group of engineers guided by Victor M. Saudek, Los Angeles aeronautical designer, and Dr. W. B. Klemperer, Douglas Aircraft researcher.

About the only resemblance between this space glider and sailplanes flown at sporting meets would be its lack of an engine. It would be big and heavy, weighing a ton and a half. One design submitted to the Air Force calls for a fuselage 43 feet long, wings spanning 120 feet and a rudder 15 feet high.

The capsule cabin, big enough for two men and 650 pounds of instruments, would have a big parachute. If things went haywire up where space begins, the crew could jettison their sealed cabin and chute down inside it to altitudes where they could safely bail out of the cabin. A detachable cabin has more prosaic advantages, too: It could be wheeled into a heated hangar for servicing; and it



would have emergency parachute to float it down to altitudes where crew could safely bail out.

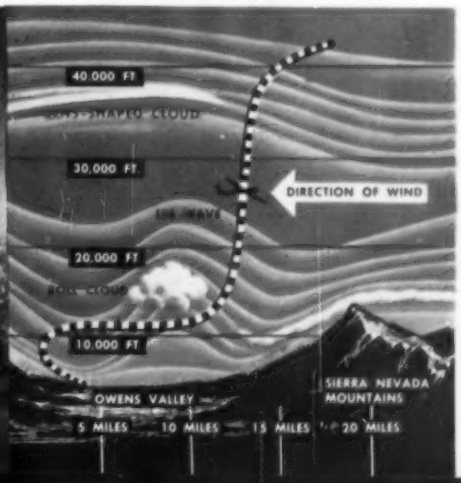
Climb 13 Miles

could be exchanged for another cabin with an entirely different set of equipment which would suit it for some other type of air mission.

The cabin would be sealed airtight and pressurized with air from liquid oxygen tanks so that the crew could fly with masks off even at 13 miles altitude. The crew would still have to wear pressure suits, for if the cabin's pressurization should fail at top altitude, the very low outside pressure there would literally make the fliers' blood boil and they would be killed. Their suits, gloves and boots would be heated to shield them from the numbing chill of outside

LENS-SHAPED CLOUDS MARK AIR WAVE that could float glider into space. Lee wave is formed when wind pours down over mountains (right in photo below), then rebounds high over valley.

ANATOMY OF A LEE WAVE is clearly revealed in sketch, which shows a vertical cross section of a very strong one. Probing sailplane rode these updrafts above 40,000 feet.



LIKE RUNNING INTO A TRUCK is the way glider pilot Laurence Edgar describes turbulent blast of lee wave that tore him out of safety harness and shot him through cockpit canopy. Force of shock made him momentarily feel heavy as a Cadillac. The glider itself was wrecked.

temperatures as low as 112 degrees below zero.

Electricity is to be supplied by storage batteries supplemented by a wind-driven generator. The generator would be used when the glider was being towed or was descending, but would be retracted during normal flight to reduce drag.

Designed to be twice as strong as an airliner, the big glider would stand up under forces 10 to 12 times gravitational pull, and greater loads momentarily. Even fighter planes are generally built to take only forces nine times gravity.

MOCK-UP OF SPACE-GLIDER CABIN is shown below. Ship is designed to carry on high-altitude exploration started by University of California at Los Angeles and the Air Force.

Such massive strength is required because of mighty, often turbulent air currents the glider may encounter on its climb up into space. It would be towed aloft by an airplane and released into the strong updrafts of a "lee wave"—a powerful upflowing wind that would carry it into the lower reaches of space in two to four hours. The craft could then "take off" for as much as four hours of exploration before descending.

This lee wave, which could lift a heavy glider 13 miles, is one of the most startling discoveries of the past few years' probing into the mysterious ocean of air we inhabit. The wave is created whenever a strong wind meets a steep mountain ridge head-on. The wind flows over the mountain tops like water over a dam, dashing down into the valley on the far side. As it falls, the air is compressed and heated so that it expands again. This makes it bounce above the valley and rush faster and faster to heights far above the mountain top. Updrafts in such a lee wave, and downdrafts when it plunges earthward again, may hit mile-a-minute speeds.

Often moisture will condense along the crest of the wave, forming unusual lens-shaped clouds. These clouds have been seen as high as 19 miles in the air.

A glider has already flown to 44,255

[*Continued on page 256*]

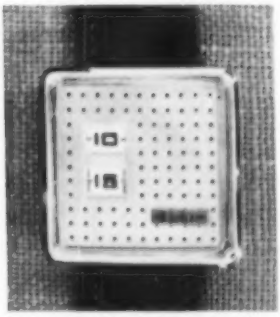
Designers Dream Up New Ways to Tell Time

YOU'D never have to wind the experimental timepiece shown at left. It snaps on the telephone and keeps itself wound by the motion of the dial mechanism. Three calls a day are enough to keep it ticking.

It was one of several timepieces of the future exhibited by Elgin at the National Jewelry Show. Strictly in the dream class was a nonworking solar watch designed to capture the sun's rays and convert them into electrical energy which would run the tiny wheels and gears. Some other Elgin watches —working models—are shown below.

TELE-DIAL WATCH tells hour in window. Black line moving around dial shows minutes.

FROGMAN'S WATCH registers depth as diver descends. Water enters tube, moving indicator.



DIRECT-READING WATCH has twin ports in which hours and minutes roll into view.

Two Engines Run Five-Tonner

TWIN engines turn out 180 hp. to drive this cross-country truck at 50 m.p.h. Power goes back to a transfer case at the chassis' center, and then forward and to the rear to balloon-tired wheels. Nicholas Straussler & Co., London, built the big vehicle.

GIs Get Featherweight Radios

THAT'S a radio receiver strapped to the helmet of the infantryman above. About as big as a king-size pack of cigarettes, it weighs only nine ounces. The Army has a new "transceiver," too, that sends and receives messages. It weighs less than a pound.

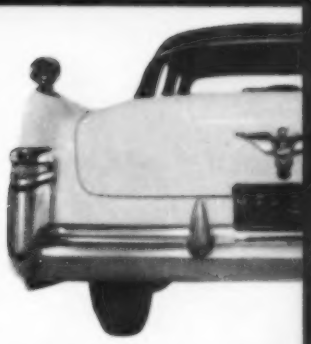
A Gallery of 1956 Cars

Continental

A new car—at $2 a pound

A BUNDLE OF HAUTEUR molded into sheet metal, the Continental Mark II is a revival of a masterpiece of automobile styling that first appeared as a production model in 1940. It vanished in 1948. The new Continental is 56 inches high and a bit more than 18 feet long. It's elegant. It's stridently conservative. It's also America's most expensive car. Got $10,000? For full details, see page 122.

Imperial | Those tail-light eggs are bigger yet



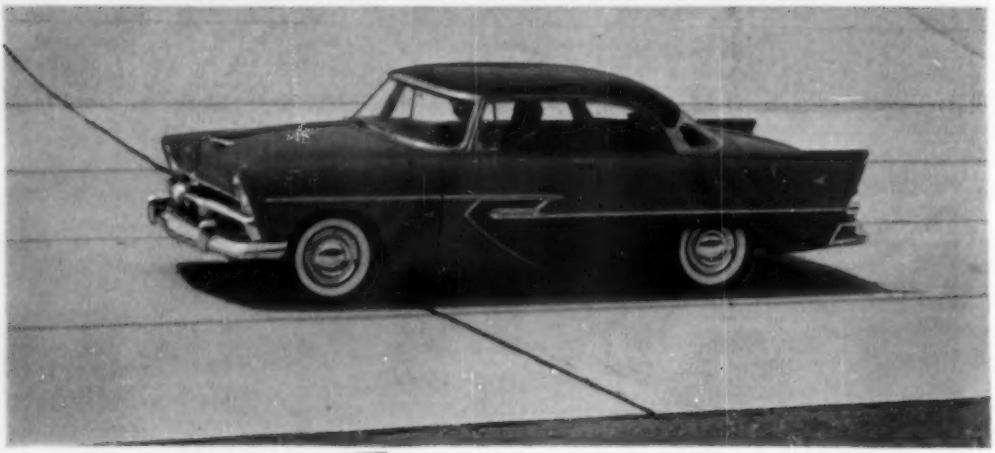
PACED BY THE SNOOTY IMPERIAL, Chrysler Corp. vehicles for '56 sport completely redesigned rear ends. The aft running lights on this car, appropriately pedestaled, have grown. Behind those new wheel plates is a new type of brake that—the company says—ought to give the owner up to 60,000 miles without relining. There's more power, of course. For more on the whole Chrysler line, see page 115.

Chrysler | Now hash marks on the fenders

ONLY A SHADE LESS SNOOTY is the Chrysler New Yorker. Any sergeant will respect those chrome strips on the fenders. Added rear overhang makes the car three inches longer.

Dodge | Fins soar and upholstery breathes

FINS ON THE DODGE are king-size. Like those on all other Chrysler Corp. cars, they can well close the book on this trend in styling. Shown here in the convertible version, the Dodge also has seat fabrics that "breathe"—the pattern is in bas-relief. For added gas mileage, the hemispherical cylinder head has been replaced with a "polysphere." Hotter plugs of a new design help. Protruding further into the fuel-burning area, they permit leaner mixtures.



Plymouth

Tail styled for Air Age

THE SIMILARITY in rear-end styling between Plymouth and a jet plane is purely intentional. Emphasizing safety, the new cars have stouter door catches, a dished-rim steering wheel, optional padding in the driver compartment, and extra seat anchorages.

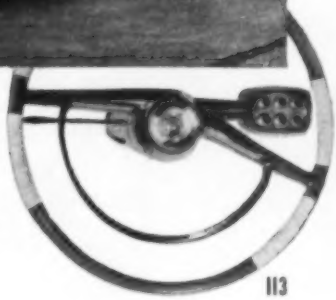
DeSoto

Twin light clusters tell the tail

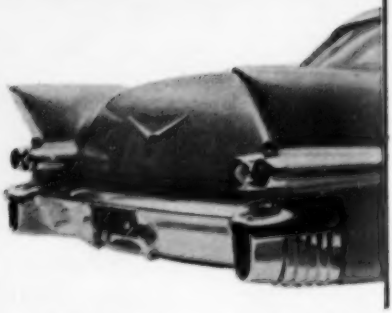
GOING DODGE ONE BETTER, DeSoto has *three* (instead of two) lights in clusters under each of its awning-like fender tips. The top bulb is for stop and turn, the middle one for backing up. The bottom one is a running light. The grille, minus DeSoto's traditional "teeth," is a marked improvement. As on the Imperial and Chrysler, a gasoline-fired heater, providing warmth for the car's occupants in one minute, is optional equipment.

Packard

Slicker and quicker, with punchboard control

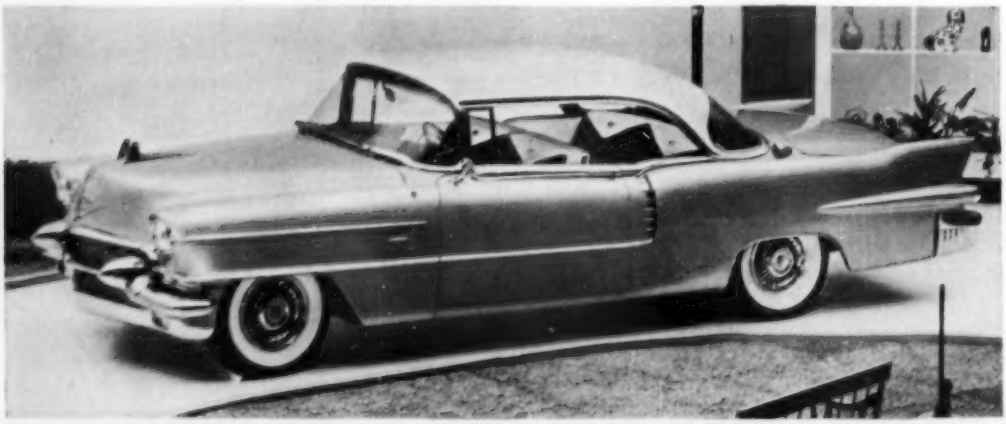


FULL-LENGTH STRIPE suggests flashy performance of new Packard Patrician, powered by Detroit's biggest engine. Push buttons (right) select transmission range. For more, see page 128.



Cadillac Big-finned Eldorado gets a hard top

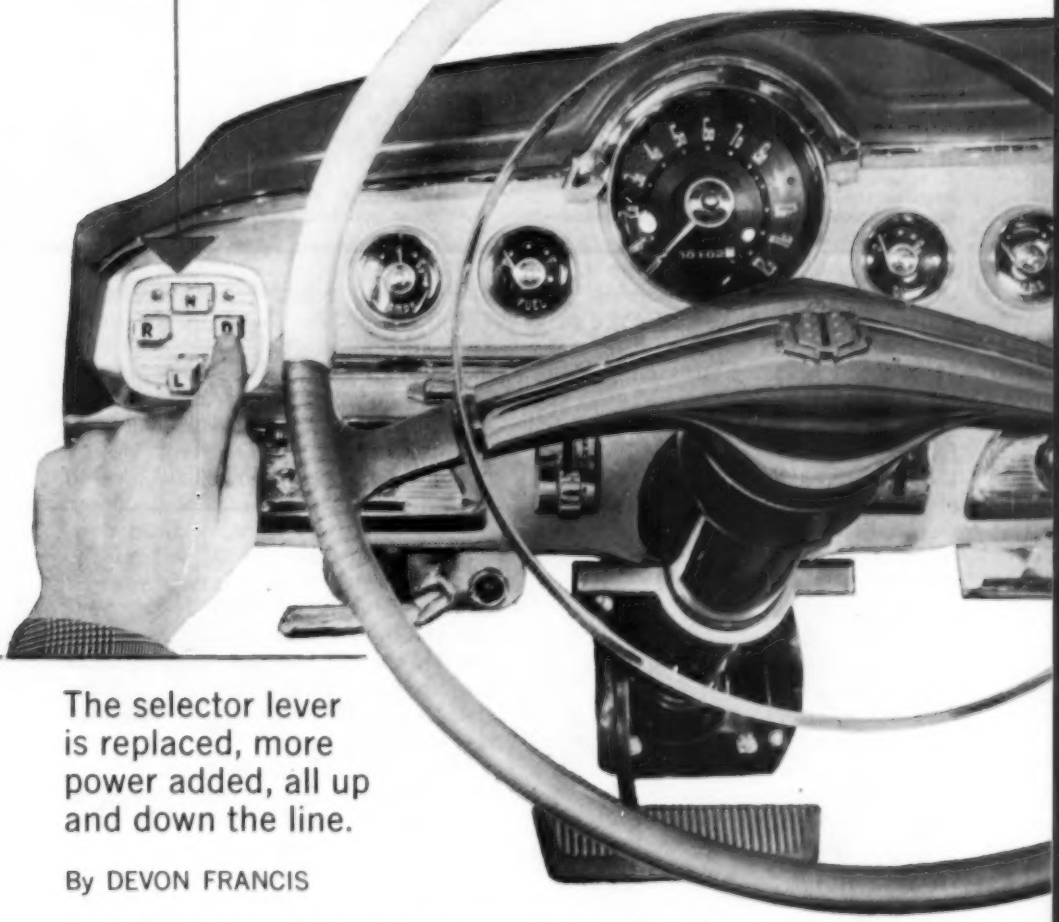
WITH 305 HP. UNDER THE HOOD, the Eldorado now comes in a hardtop version. The grille—surprise!—is cast aluminum, given a golden color by a dye process. Exhaust ports snaked through the bumper have a louvered effect. For more about both cars here, see page 119.



Pontiac Silver streaks blend into sheet metal

AND WITH 227 HORSES IN ITS TOP LINE, Pontiac has changed its two-tone trim, depressed its silver-streak trademarks into the sheet metal, enlarged the tail lamps and put wind splits on the rear fenders. Even the instrument panel now comes in two colors. Pontiac also is introducing a four-door hardtop model for '56.

Chrysler Adopts Push-Button Drive



The selector lever is replaced, more power added, all up and down the line.

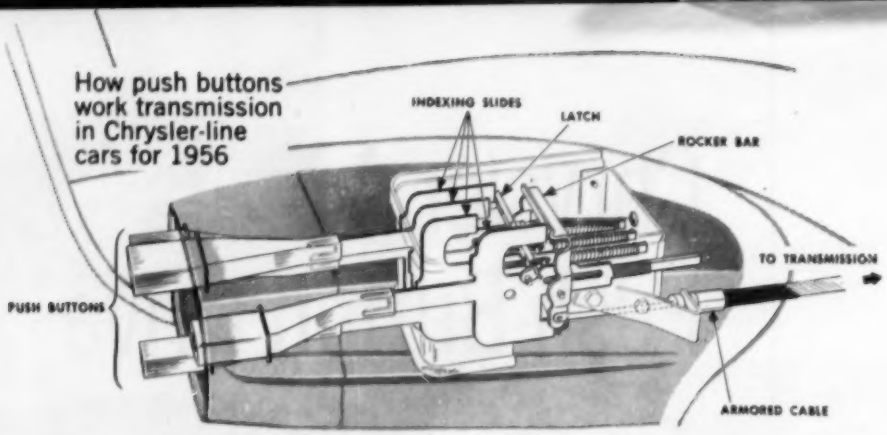
By DEVON FRANCIS

FRIEND of mine got into a new Dodge the other day, and sat there bewildered. He fumbled. He searched. He shook his head.

"Okay," he sighed finally, "I give up. What makes it go?"

What bothered him was the absence of a selector lever for the automatic transmission. It wasn't on the steering column. It wasn't on the instrument panel, where it had reposed in the 1955 cars.

It wasn't anywhere, in fact. For the '56 Dodge—along with all the rest of the Chrysler Corp. cars fitted with automatic



FOUR BUTTONS AND A CABLE take the place of the selector lever and customary linkage to the automatic transmission. Pushing a button shoves an indexing slide against a hinged, spring-loaded rocker bar to which the cable is attached. Since the slides are of different lengths, the cable is pulled a different distance—depending on the button pushed—to open and close ports in the transmission valve for Neutral, Drive, Reverse or Low. A cutout in each slide hooks to a latch, locking the rocker bar in position. A ramp releases it when another button is pushed. Above 10 m.p.h., hydraulic pressure in the transmission control system moves a piston to keep the selector valve from engaging reverse gear.

drives—has gone to push buttons. They are on the panel at the left of the steering wheel, projecting from a little box. To go, you push a button and step on the gas.

Push-button driving (an idea shared for '56 with Packard, see p. 128) wasn't the only rabbit that Chrysler pulled out of the hat when its five flavors of cars were announced last month. It wasn't the trickiest, either. That title went hands down this time to an automobile record player (see p. 132).

This is an off year, as they say of elections not involving the Presidency, for the parent Chrysler company and its divisions. Detroit usually scraps its models only once every three or four years and starts new ones from scratch. Most things were new in Imperials, Chryslers, Dodges, DeSotos and Plymouths for '55. It's touch-up year in '56—like fresh paint here and there on your house.

Nonetheless, the changes are considerable. Dodge and its sister cars are bracketing push buttons with a series of developments designed for greater safety.

Take brakes. The Imperial, built for the lorgnette and squash-rackets trade, has a new type. The Crown Imperial began mounting disk brakes in 1949, and a more conventional brake now replaces it.

The nub of the change is the shoes. Most brake drums tend to anger in hard braking. They heat and distort and get out of round. That leaves only the toes and heels of the shoes in contact with the drums. So it takes longer to stop.

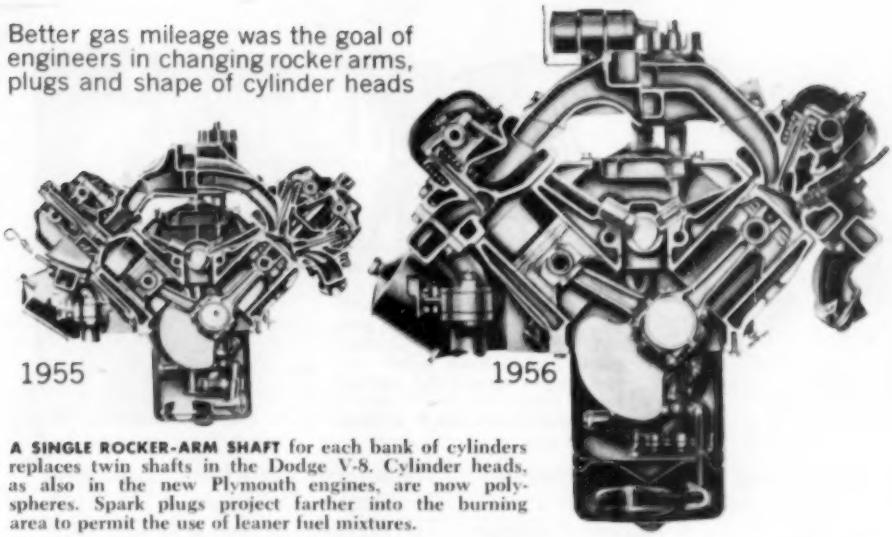
The new shoes float. They have no fixed anchors. The full area of the lining remains in contact with the drum.

The engineering people behind the chromed portals of the Chrysler research labs on Detroit's Oakland Avenue venture the opinion that the linings of the new brakes will last more than twice as long as those of other designs. Chrysler and DeSoto '56 models also have this new kind of brake.

Dodge and Plymouth power brakes have undergone surgery, too: a matter of changing the design of the power assist. If the engine stops and the vacuum power for the brakes dribbles away through repeated pedal applications, the power unit is automatically divorced from the linkage train. That means you don't have to strain your leg muscles to reach the drums *through* a dead power unit. Power-off braking is easier.

Finally, that floor hole is gone; the pedal swings from an underdash hinge.

Better gas mileage was the goal of engineers in changing rocker arms, plugs and shape of cylinder heads

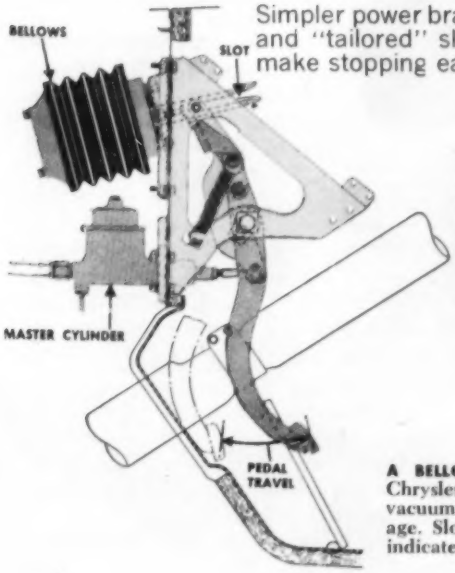


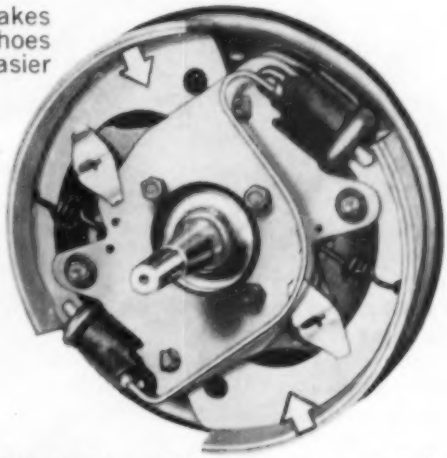
A SINGLE ROCKER-ARM SHAFT for each bank of cylinders replaces twin shafts in the Dodge V-8. Cylinder heads, as also in the new Plymouth engines, are now polyspheres. Spark plugs project farther into the burning area to permit the use of leaner fuel mixtures.

Take door latches. Detroit's sheet-metal curtain has been lifted at last on the distasteful subject of designing cars for the health of their occupants. (See "Detroit Prepares to Stress Safety," PSM, Aug. p. 88.) Manufacturers now concede that trees and bridge abutments are astonishingly immovable. Last fall, one company fashioned a safety door latch that didn't reach production; the top brass shrank from the implication that their cars might be dangerous.

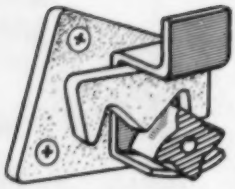
Chrysler Corp. latches for '56 are designed specifically to help doors resist that impulse to fly open in a smack-up. The idea is to keep you and your passen-

Simpler power brakes and "tailored" shoes make stopping easier

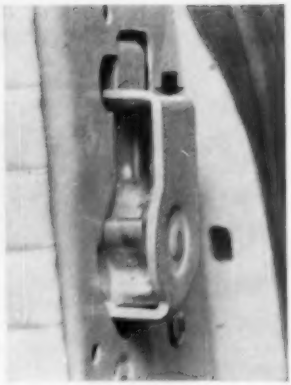




A BELLOWS IS THE HEART of a new power unit for Chrysler Corp.'s power brakes (left). Collapsed by vacuum, it pushes a piston to supplement pedal leverage. Slot divorces it from pedal if vacuum fails. Arrows indicate new shoes (right) on Chryslers and DeSotos.



STRIKER PLATE on Chrysler's safety door latch (left) is anchored half an inch from the door post instead of flush, with an "eyebrow" above it to protect clothing. That arrangement, plus a strap guard (arrow, right) around the toothed rotor, keeps the two (above) from springing apart in a crash.



gers aboard when impact inertia sets in.

Take seats—anchored better to a reinforced floor. Take a dished steering wheel—designed to prevent impalement of the driver on the steering column. Take padding—made of an energy absorbing material, for places like the top of the windshield, so people can hit their noggins without fracture. The padding is optional. And, of course, take seat belts—an optional item in Chrysler Corp. cars since last spring.

The Imperial's new modified Hotchkiss drive, designed to reduce sway in turning a corner, probably can be classified as a safety item, too.

Other changes in the company's stable of vehicles are those common to the industry. All the cars wear new rear fenders—known in the die shops as "quarter panels"—for Detroit's version of the Dior look. It's a surprising refurbishment for an off year. Most manufacturers are content to move some chrome around.

Horsepowers hit escalator. In the horsepower race, the biggest of the Plymouth engines, with power pack, delivers 200 horsepower.

Courtesy of *Motor* magazine

HISTORICAL NOTE: Push-button driving isn't new. In this 1913 S. G. V., six buttons shifted gears by solenoid for four forward speeds, reverse and neutral.

The biggest Dodge is at 230 hp., up 37. The biggest DeSoto is at 255, up 55. The biggest Chrysler is at 280, up 30. The Imperial's power matches that under the Chrysler's hood.

For the record, Dodge's horsepower today is more than twice what it was just five years ago.

What these horsepower increases mean to performance is reflected in comparative figures for getaway when the light turns green, and for passing.

Dodge's 1953 Coronet equipped with a torque-converter transmission, first of this brand of car to adopt a V-8 engine, jumped from a standing start to 60 m.p.h. in 15½ seconds. The 1956 Dodge, similarly equipped, does it in 12.2.

It took the 1953 Dodge 8½ seconds to pass another car going 60 m.p.h. The 1956 Dodge has cut it down to 6 2/3 seconds.

For those who think that power is a latter-day fetish, however, be it remembered that the 1936 Duesenberg could have widened its fenders and taken flight on its 265 horses.

But the Duesy didn't have those lovely push buttons. END

Hydra-Matic Dampens That Thump

Cadillac-Pontiac transmission now rivals torque converter.

ABOUT four years ago General Motors began fiddling around with an idea for improving the Hydra-Matic drive on its Oldsmobile, Pontiac and Cadillac cars. The transmission had zip. It was miserly with gas. But every time the gears shifted, it thumped.

The payoff on GM's research came last

NEW HYDRA-MATIC substitutes little fluid coupling (shown at right, posed above transmission case) for friction clutch to smooth out gear changes. It fills or empties in 2/5 second. One-way clutch (above, with inner race) replaces the sometimes-troublesome bands that used to switch planetary gear ratios.

HEAT EXCHANGER (arrow) cools transmission oil. Unit's weight in Pontiac version remains the same—225 pounds.

Caddy's cockpit has three-spoke wheel, center glove box

ASH TRAYS AND LIGHTERS are duplicated at each side of panel, knobs and escutcheon redesigned. Script on right dates car as a '56. Rear-view mirror is wider, and electric window buttons require no contortion. Lowered brake pedal is now pendant type.

month when the shrouds were stripped from the 1956 Pontiacs and Cadillacs. The almost-new transmission wasn't the only change in these two vehicles by any means—we'll come to the others in a moment—but it was unquestionably the most spectacular change.

Major surgery has been performed on the Hydra-Matic. It still has zip. It's still miserly with gas. But most of the thump is gone. It's the biggest change in this particular transmission in 15 years.

For smoothness, the Hydra-Matic for the first time can give the torque-converter transmission (used in most other cars, including the Chevrolet, Ford and Plymouth) a run for its money.

To do this, the engineers had to throw out some hardware and add new pieces. To see what they did and why, it's necessary to take a second gander at how a Hydra-Matic works.

Its guts are gears, as contrasted to torque-converter transmissions consisting of gears *and* a hydraulic torque-multiplication system.

Torque multiplication is mumbo jumbo for slowing r.p.m. on the rear axle and speeding the engine. That provides more push at the rear wheels when the light turns green. With ordinary first-second-third shift transmissions, this is done by hand. With Hydra-Matics and torque converters, it's done automatically.

The gear drive of the Hydra-Matic, embodied in two sets of planetaries borrowed from Ford's old Model T, has been a source of sublime satisfaction to the engineers from the beginning. True, it did thump a bit in shifting from first through successive gears. It thumped going down on deceleration, and that last thump—from second to first gear—was the most annoying of all. Everybody in the car involuntarily curtsied as it neared a stop.

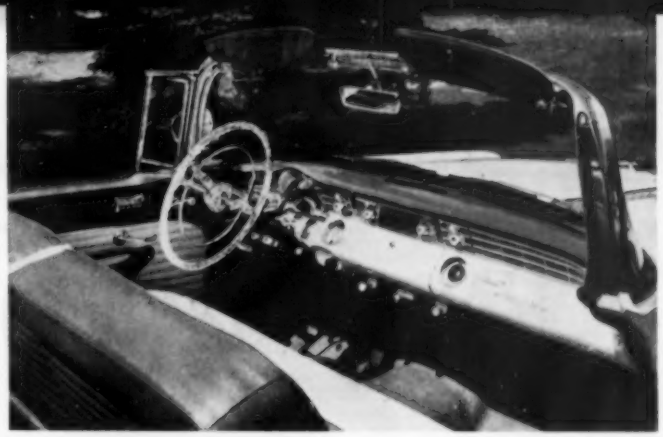
This unhappy fault seemed inherent in the design. Road speeds governed the shift points. The rate of rotation of the rear wheels dictated, within limits, the points where a car would plaster a person against the seat or, slowing down, make him nod like a puppet.

The trouble lay in a brace of friction clutches that acted something like the foot-operated clutch on a manual-shift car. The gears shifted. And there was that thump. It was the Hydra-Matic's thumps, in fact, that led to the development of the torque converter. The torque converter didn't have the zip. It used more gas. But compared with the Hydra-Matic, it was silk-smooth.

It was the Hydra-Matic's thumps that caused the designers to interpose a fluid coupling between engine and transmission soon after its invention. This coupling, softening the eye-teeth jar and letting the engine idle in gear, is nothing more than Chrysler's old Fluid Drive (see "Auto Transmissions that Shift for Themselves," PSM, Dec. '45, p. 142).

The champions of Hydra-Matic (their enthusiasm can be equated roughly with that of Brooklyn Dodger fans) have said all along that sure, there were thumps, but a Cadillac with Hydra-Matic could go farther on a gallon of gas than a Chev-

Pontiac convertible's interior features white-on-black trim



KNOBS IN WHITE PLASTIC make controls easy to see. Decorative plates on instrument panel are brushed aluminum, recessed in black. Cigarette lighter, at left of glove compartment, is nearer driver. New to Pontiac is signal-seeking radio—optional equipment.

rolet with torque converter. That's true.

Now, finally, they have found a curative for the thumps. In principle, the solution was simple. They reached into the innards of the thing and scissored out one of the two friction clutches. In its place they put a fluid coupling.

This second fluid coupling is small. It's quite tricky. When oil is valved in, the coupling freezes the front planetary while the other planetary multiplies the torque. When oil is valved out, the front planetary performs its part of the legerdemain in the gear-shifting operation.

Filling or emptying the coupling requires a mere fraction of a second.

The coupling freezes the unit only between the Hydra-Matic's first and second gears, and between third and fourth. Between second and third, that remaining friction clutch freezes the rear planetary, and there you do get a thump. It's tiny, though, and just about what you get in a torque converter with a gear assist, that in the Buick excepted.

(Buick has its own way of doing things —no thump at all. We'll tell you about that next month.)

The only reason the engineers didn't replace the second friction clutch with a little fluid coupling was that there was no room for it. Even as it is, they had to immerse the front planetary in the big fluid coupling to save space.

HYDRA-MATIC DRIVE QUADRANT has a park position added. Heretofore, reverse served this purpose. The car can now be braked firmly on a hill and the engine started in "park" instead of only in neutral. Left arrow is for normal driving; right one locks out fourth gear for mountain climbing or city driving.

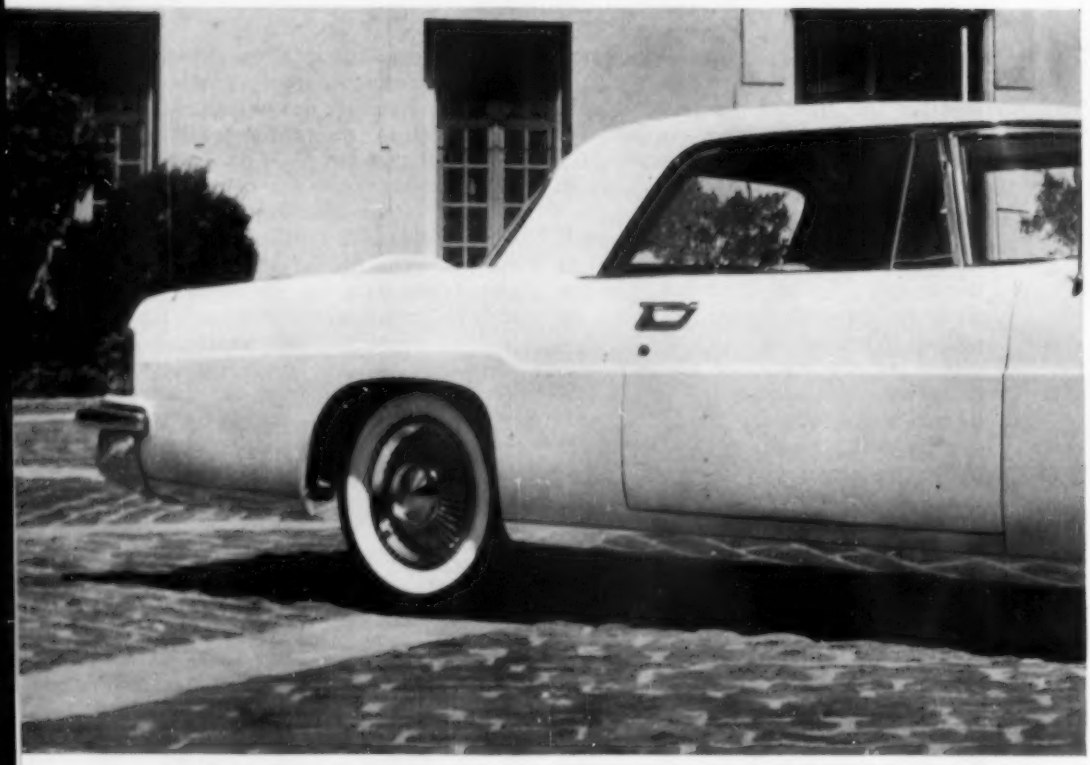
Exorcising the thumps is by no means all that has been done to the '56 Hydra-Matic. From the beginning, gear changes in this transmission have been made with bands that seized and stilled the sun gear or the ring gear on the planetaries—even as Henry Ford did with his pedals on the toeboard. The adjustment on the bands, comparable to those external-contracting brake bands of yesteryear, was critical. They got worn. They slipped. That made them wear worse.

So now they've taken the bands out. In their place are two one-way (or overrunning) clutches—exactly the same thing that makes a coaster-brake bicycle freewheel. They are so foolproof that Pontiac, for one, has advised its dealers that it won't have to bother with adjustments on them. Experimental cars have been driven as much as 70,000 miles without a transmission tear-down.

There are other modifications. Most important is one that has to do with a dead spot, around 25-m.p.h. road speed, that has afflicted Hydra-Matics when they went into fourth gear at light throt-

[Continued on page 260]

Continental Unveils A Royal Coach for Four



By KENNETH WYLIE

WITH a wave of its wand, Ford's Continental Division has finally brought forth a glittering bundle of automotive hauteur, the Mark II. Though plainly a car born under a star, the company took no chances; it bolted a specially made star right to the hood.

From the chaste grille, a handsome honeycomb that sniffs the road winds, back 18 feet to the armor-massive rear bumper, the Continental is as sleek as a suite at the Waldorf and as conspicuously simple as the Washington Monument. Yet every niche and stitch of the car is full of tricks:

Goodies galore. Each passenger has

Staggeringly lush, Mark II is the stuff that dreams are made on. It's also a good car.

his own cigar lighter and ash tray (a person so rich as to smoke two cigars at once will have to make do somehow). Touching a hidden button beneath the back bumper causes the left tail light to glide aside like a secret panel in the Duke's library, revealing the gas filler cap. The hood release has the feel of a safe handle. Underneath, three automatic lights illumine the engine's brushed brightwork. The door to the glove compartment is spring-balanced, saving you the chore of easing it down, and the vent panes in the windows are motorized to eliminate a further source of fatigue. The driver's seat can be button-fingered into as many positions as a six-year-old at church. And that stellar hood ornament is no chromy bauble but an investment casting of stainless steel, like the inlays

HONESTY AT ALL COSTS was the word passed the designers. So the spare had to be under the lid bulge that tradition dictated. It's not as awkward with luggage as it looks. Not quite.

TOUCH A BUTTON (my left hand shows area) and the left tail light does a peculiar shuffle, ending up in this disjointed state. Nestling in the exposed cavity is the gasoline filler.

Mark II has sleek elegance in details as well as in lines

HONEYCOMB in door breathes gently warmed air on rear-seat passenger's tootsies, in case his circulatory system has been weakened by rich living. Note quality of fitting and finish.

NEST OF BUTTONS lies conveniently at the driver's hand. The handle is the door release, which works with silky ease. The interiors are designed to have "a sartorial splendor."

in a Commissar's teeth. The price for these and other princely comforts is $9,800 to $9,900. This includes the spare tire and almost every conceivable accessory except air conditioning, for which you still pay extra.

That spare. Since the nakedly visible spare was almost a trademark of the earlier, Mark I Continental (1940-'48), some reminder of it was essential. The reminder is a kind of inverted pouch stamped in the rear deck, which rises from the sheet metal as distinctively as a big, streamlined wart on a pretty woman. Raise the deck lid and you'll find the leatherette-booted wheel itself

leaning inside, its bottom fitting a well in the trunk floor.

Some critics will complain that this spare-tire blip on Mark II's sylphy lines is a superfluous flourish. Others will contend that it is a touch of identity, like a Rolls radiator. Still others will argue that, esthetics aside, it is an awkward place to locate the spare. Swinging a fly-rod case past it won't exhaust you, but anything heavier may involve standing at one side of the trunk, planting your feet well apart, and handing the luggage to George.

Carpeting in both the trunk and front (it's identical) is the kind you want to run barefoot through. All-wool, ¾-inch thick, and rubber-backed, it's almost deep enough to lose keys and change in. Merely touching a brogan to it makes you feel that the world is, after all, a pretty good place.

Come for a ride. You enter Mark II via a gaping door and then step down to the floor slung between the frame rails. This helps give the car its snaky center of gravity, and permits a roof line only four feet eight inches off the ground. Inside it is not cramped but distinctly intimate. There are 59.6 inches of hip room in front and 56.9 in back—plenty for four passengers but little, considering the high shaft tunnel, for any more. No matter: this isn't a bus for hauling the youngsters to school, but a personal car for elegant, adult motoring.

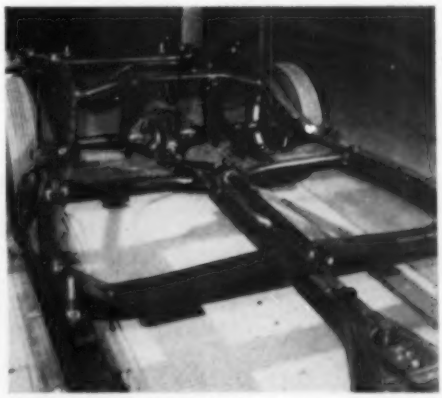
The seats that embrace you may be covered with Scotch cowhide, specially obtained from a district where the cows are of noted amiability. (Continental people explain that this isn't pure fancifulness; gloomy or irritable cows poke each other with horns, slightly marring the leather.) Or the seats can be covered with nylon, broadcloth or a quilted fabric called matelassé. Or any combination of leather and fabric, or any material the customer elects, including a combination of his favorite tweed and her cocktail sheath.

Machinery, too. Everything is powered or automatic in Mark II—brakes,

[*Continued on page 264*]

LORDLY ENGINE ROOM is well stocked with able machinery. De luxe touches include special rocker-arm covers, twin air-induction system and great amounts of sound-absorbing matting.

BEEFY AND LOW, special chassis has heavy box and tube cross members by rear of engine. The twin exhaust pipes run outside to clear the dished floor pan. Wheelbase is 126 inches.



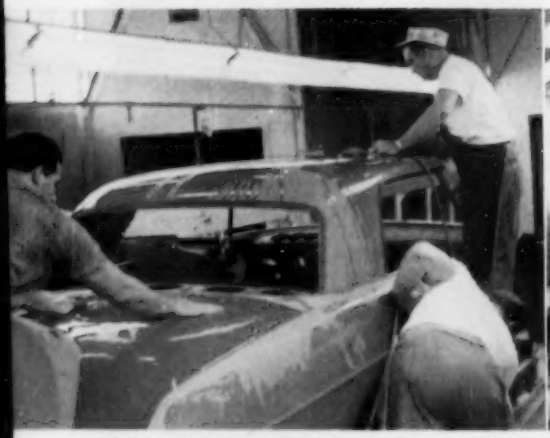
SPINE carries drive shaft on top. In rear a crossover pipe joins the two exhaust systems to minimize tailpipe talk. Four big apertures in the frame give riders room in the low car.

For a backstage visit to Continental, please turn the page

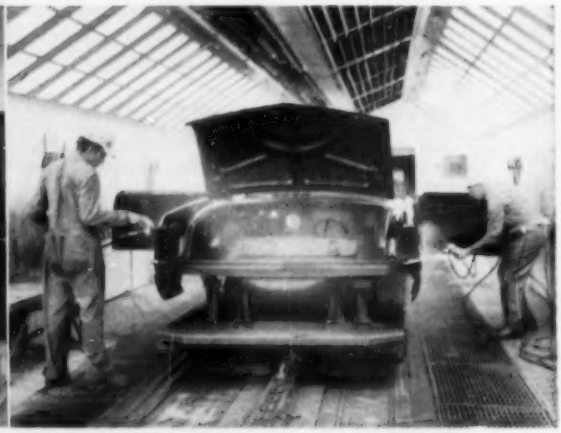
Making the Mark II: Why It

THESE pictures, taken by PSM at Continental's jewel-box new plant (left), help explain why the car is so costly. Its components are expensive to begin with, but the Mark II price tag could be nearly halved if these parts were slammed together on a high-volume line.

The big cost arises from careful selection and painstaking hand assembly to finicky standards. Into the plant there flows a stream of Continental parts; a



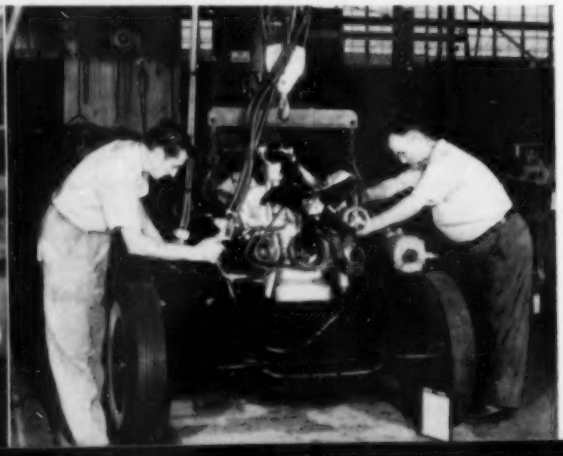
2 WET SANDING curries primer coat. Every inner and outer metal surface is coated, including those later invisible. The entire body is wet-sanded at two different stages.



3 FOUR DOUBLE COATS of colored lacquer are sprayed on top of two gray surfacer coats, which are on top of two red primer coats. Each of the double lacquer coats is also oil-sanded.

6 NO HURRY. A lone craftsman here patiently fiddles with a minor detail. The general rule in the plant is that it's much more important to get it right than to get it done.

7 ENGINES aren't installed until they pass a rigid set of tests. All major nuts and bolts are hand-torqued; all moving parts are balanced individually and then together.



Costs $10,000

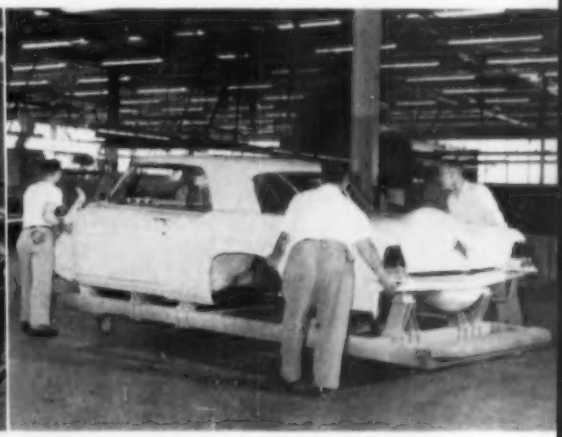
smaller stream flows *back* to suppliers—parts rejected because they just miss meeting quality standards.

Across wax-sheen concrete floors, Continental's 225 plant employees pick and choose, file and grind, ease and polish until they finish a 2½-ton vehicle that the inspectors will accept.

"Our system," says manufacturing chief Norm Crisman, "is the reason why, with Continental, every car is like the one you make for the big boss."

1 TRIAL MARRIAGE. Body parts are assembled "in the white"—unpainted—and fitted to a tolerance of .025 inch. When right they are keyed for later identical reassembly.

4 SKILLED UPHOLSTERERS sew up individual interior fabrics or fabric-and-cowhide combinations for each car. Or the customer may supply his own material for Continental to use.



5 GENTLY DOLLIED up to final assembly is a body on which a crew of six may have worked 60 hours. Cars are built by small teams, not by running a production-line gantlet.

8 DYNAMOMETER RUNS are used both to make sure engine and power train have been built right and to sharpen tuning to a keen edge. The car needs no "preparation" before delivery.

9 IS IT REALLY DONE? The plant won't let a car go until it has been waxed and polished three times, oil and oil filter replaced, and everybody's happy about its details. END

Packard's Big Engine

374-cubic-inch job is out in front with a mighty 310 hp. You control it with automatic push buttons on a keyboard.

By EDWARD D. FALES JR.

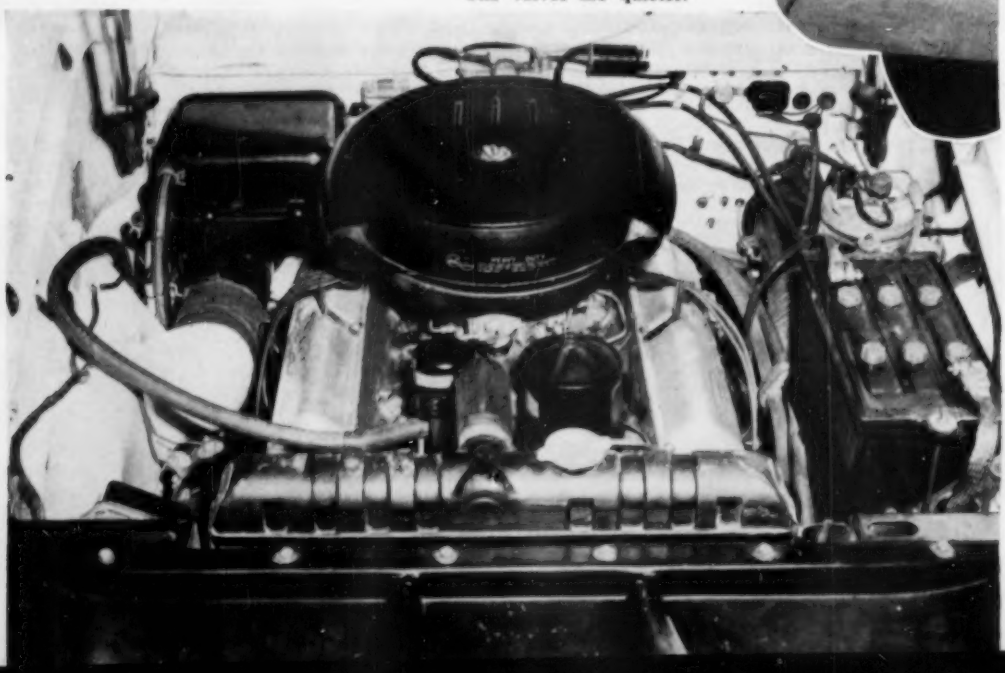
YOU are about to drive the new Packard Patrician around the 2½-mile test track at Utica, Mich. You're a little excited because this isn't just billed as a 290-310 hp. engine: it's the *biggest* U.S. production-car engine (374 cubic inches). And you're going to control it by playing Packard's new "driver's piano."

This is a little console of six push buttons sticking out from the steering post and nerved electrically to the transmission system. Push D and you work up through a two-stage torque converter into direct drive. Push H and you have plush torque conversion throughout—from zero up.

They hand you the '56 Patrician—a slick piece of class. Nothing gaudy. It's got a long-low-wide look. The tail beacons flare like northern lights when you toe the wider '56 brake pedal.

There are three men with you in this four-door family packet on a 127-inch wheelbase. You stop at the track gate

THAT HOOD HIDES what Packard calls the biggest engine in the industry. The four-door Patrician's lights have longer eaves. Grille and ornament are new; bombs are farther apart for that wide, low look.



THIS MAN-SIZED V-8 has been given the job. Outwardly it looks much the same as the '55, but inwardly it's got bigger cylinders, elliptical firing chambers, a shorter stroke and longer spark plugs. The valves are quieter.

Spurs New Power Race

while three other '56 Packard products go by at 100 m.p.h.: first a "400" hardtop convertible, then the '56 Clipper (the medium-price "hot car" with a 270-hp. V-8), and finally up around 115 comes the $6,200 Caribbean.

Now the track's clear. You punch D on the piano and gun the engine. A servomotor shifts you into drive. You plan to ease into the first turn at 60-65. But, whoa! What are you doing at 90?

Now you see why Packard's bright young men are grinning over their planning boards this year. They claim:

- *Fastest getaway* (still to be proved).
- *Horsepower* in the highest brackets (290 plus, and the Packard Caribbean is billed at 310).
- *Torque* that soars to a potent 405 foot-pounds in the Caribbean, Patrician and "400."
- *Highest compression ratio*—10 to 1.
- *Biggest cylinders*—4⅝-inch bore (up from four inches in 1955) and a shorter, 3½-inch stroke.
- A new "self-locking" differential that automatically throws torque to the slow wheel when one wheel spins madly. Re-

COMING ROUND A HARD TURN in soft, deep ruts, the author let the front wheels get untracked, got ready to wrestle back to the road but found no loss of balance or control.

sult: you now get 50-50 drive instead of 90-10 when one wheel is in the snow.

With all this scat, why didn't you *know* you were taking off? Here, frankly, is something that pains the engineers. They want you to get a *jolt* when you gun it.

But this car gets away like an arrow from a bow. In the 50-75 passing range, where acceleration counts most, it just lifts its tail and goes. You're arrow level.

This is due to the 26 feet of torsion bars that Packard put in for 1955 and has now made available all through the line.

If you use the new 2.87 rear axle, you'll get overdrive economy and still have a terrific kickdown and a torque curve that has backbone right up to 80.

What a test shows. You've been scatting around this track for an hour. And you've noted: no tire squeal on sharp turns . . . no wandering . . . a rear mirror that (like some others) gives you a hopelessly inadequate 300-foot view . . . a steering handgrip that's *really* comfortable.

With three passengers, 100 m.p.h. is enough for you—though a "400" with a test pilot at the wheel scoots past you on the high wall with three gents aboard.

"She's doing 105 and only loafing," says a test driver in your car.

And in that remark lies the real '56 Packard story.

A while back, shirt-sleeved Packard brain-trusters found themselves on a spot.

Other designers were trimming weight. Engines would be small but oh so strong. They'd go right up to 250 hp.

Then and there, the engineers made up their minds:

- The hp. race wouldn't stop at 250.
- It would take BIG engines to stand the gaff.
- Then they made a third decision: "We'll make block and crank big so that when the time comes, we'll be ready."

Buzzing curves at 95 you realize the time is here and the big block and crank are taking it in stride. There's hardly a sound. You're chatting with the boys in the back seat. The dial goes on up to 120. But what do you want with two miles a minute? You hold her down and get that "just loafing" feel.

How did they get the extra Wheaties into the same engine that in 1955 was rated 260 hp. with 352 displacement?

The big block, says Packard, lets the bore go up from 4 to 4⅛-inches and still leaves room for plenty of water. (It's this, Packard says, that's kept it from having a single cracked V-8 block.)

The new engine keeps the same rods, cylinder heads, bearings and four-barrel carburetor. Crank's a little huskier but basically the same. Only inside the block do changes show, and in the rings and

$6,200 two-masted Caribbean has even Detroit whistling

'56 CARIBBEAN: This is the luxury car in which the V-8 breaks through the 300-hp. barrier with 10 to spare stashed under its gleaming bonnet. There are twin radio masts aft. Besides the convertible shown, there'll be a hardtop. New automatic push-button drive control will be standard.

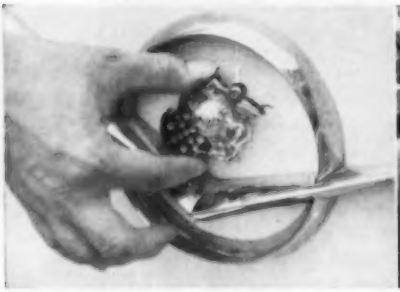
FOUR-WAY TOGGLE SWITCH replaces seat-control buttons. Just flip the lever the way you want the seat to go.

TOUGHER, THICKER new crash pad tops a rich gold dash panel. Glove box has a new lip to keep things from tumbling out.

FLICK OF THE WRIST changes Caribbean's "sofa" from daytime leather to plush brocade fabric for evening elegance.

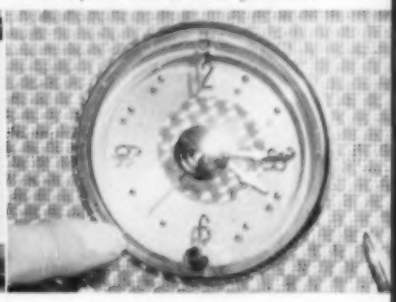
Elegance and push-button ease mark new Packard line

"TURN THE MEDALLION" latch is easy to turn when you want to snap the trunk lid open. It's a new feature in '56.



HEADLIGHTS are sinking in deeper and deeper. Eaves or hoods have been extended another five inches forward in '56.

SWEEP-SECOND HAND on the electric clock serves no practical purpose beyond helping time your starts and passes.



carb. Pistons are sturdier, valve stems wider (⅜ inch). Valves lift .024 inch higher. Manifold passages are wide and husky, and valves are two inches.

Packard says it gets away with 10-to-1 compression by going to an elliptical fire chamber and a "long reach spark." Business end of each plug is up on a pedestal where it gets a real scouring.

Packard also sent its four-barrel carb into surgery. A couple years ago drivers who didn't start in low beefed about a "flat spot." Even though they mashed their feet right down into the carburetor, they strangled their starts. To fix this asthma, the venturis have been changed. And a nerve from the throttle now refuses to let the secondary throttle open and spoil everything until your engine has enough speed to accept it! END

Clipper will be sold as a separate line, not as a Packard

352-CUBIC-INCH V-8 powers the "hot" Clipper line, which is to Packard what Oldsmobile is to GM. Test pilots say Clipper's top speed this year is up 10 m.p.h. to 116. Frame has been beefed up like Packard's '55. Result: there are fewer body noises. Fishmouth tail lights are new.

Bumps won't shake the platter that spins in '56 Chrysler-built cars.

Highway Hi-Fi Plays New 16⅔-R.P.M. Records

AS EASY TO WORK AS RADIO, auto phonograph has stops at back to guide record over spindle. You needn't look.

By MARTIN MANN

YOU'RE tooling your '56 Dodge along the Turnpike way past bedtime. Even the radio's passionate pleadings for the newest miracle toothpaste can't keep you awake. So you reach over, switch a knob to PHONO, and put on a record. The one with cymbals that nobody could doze through.

This automobile phonograph is the cutest toy for cars since windshield squirters. Highway Hi-Fi, Chrysler calls it. It is an ingenious little record player in a neat case slung under the dash to play through the radio, and will be available as an extra on all of the Chrysler Corporation's 1956 cars. The price will be about the same as a car radio.

One-hand, no-look operation. You play records with no more fuss than it takes to work the radio—an obvious safety requirement. Press a button and the door flops open. Pull out the turntable as far as it will go, pick a record from the stack underneath and push it against stops on the turntable—it drops right over the spindle. Press a lever on the tone arm and move the arm until it stops. When you let go, the needle drops into the first groove and the music starts.

No reworking of a home player, the new unit was designed for cars, from the record grooves up, by Columbia Broadcasting System and Chrysler engineers. The discs, a mere seven inches across, can play for a full hour on one side. That's because they spin at the unconventional speed of 16⅔ r.p.m. and have extra fine grooves, one-third the thickness of a human hair. The needle is a skinny .0003 inch across—a regular LP record uses one three times its size.

The player keeps right on making music, up and down hills, over bumps and around tight corners. Chrysler claims it shrugs off almost any jolt that won't send the car to the nearest garage. A Dodge engineer rode me over curbs with the phonograph going—it didn't miss a beat. And I listened to an unmounted unit playing beautifully while it was tilted almost on its side.

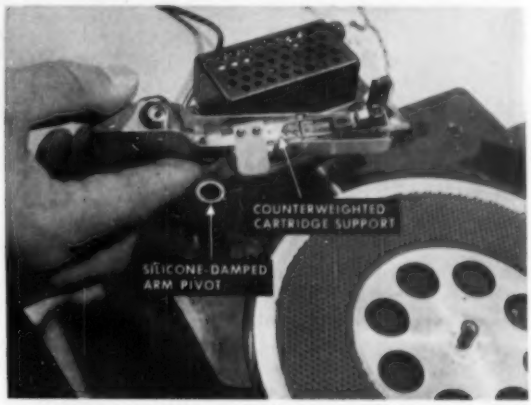
The ruggedness that makes the music go on no matter how you drive is built into every part. The turntable base, for example, is a heavy metal casting—plenty of inertia to make it just want to sit still. It rests on three 1¾-inch-thick neoprene rubber sponges, which can soak up big bumps.

The tone arm is also engineered to hug the groove and ignore distracting bumps. It swings easily when pulled slowly by the record grooves, but holds

[*Continued on page 270*]

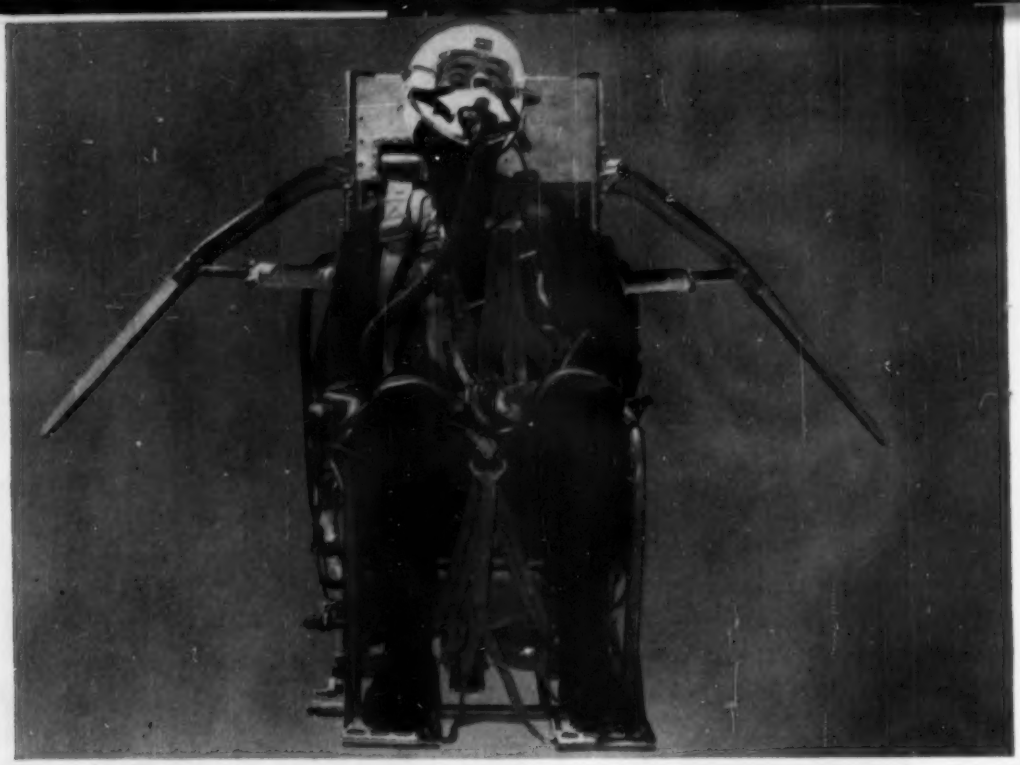
PRESS LEVER ON TONE ARM, swing arm till it stops, let go, and needle drops into first record groove.

CLOSE IT UP AND LISTEN TO MUSIC. Slow speed makes one side of small disc play for an hour.



DESIGNED FOR BUMPS, unit plays on rough roads, around tight curves. Tone-arm pivot, containing silicone fluid, resists sudden forces yet gives to gentle pull of groove. Cartridge weight is fully counterbalanced.

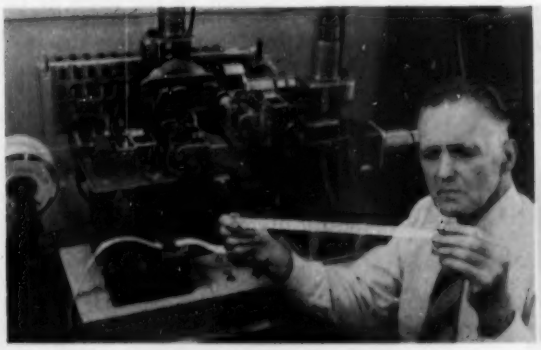
YOU'D HAVE TO DRIVE UP A WALL to make the needle skip a groove. The player was making good music when tilted for this photo by Dr. Peter Goldmark, Columbia Broadcasting System research chief. The new unit is an optional accessory for Dodge and other Chrysler cars.

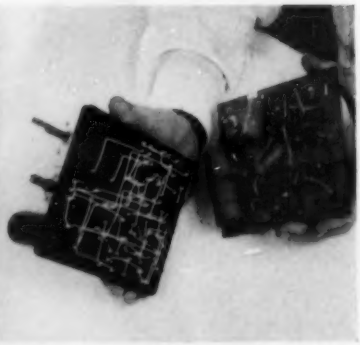


Downward Ejection Seat: In case of bail-out, the pilot of Douglas Aircraft's new X-3 will be hurled *downward* out of his fighter. Reason: at advanced speeds the force required to shoot the pilot *up* out of the plane's path is beyond human endurance. Fins stabilize the seat down to 15,000 feet, after which a parachute takes over.

New machines, new methods, new theories, go

Under Test for Tomorrow's World





Circuit Weaver: A first cousin of the loom, this Bell Labs machine gets its orders from a punched tape, and delivers a complex electrical circuit with solderless wrapped connections. The circuit at left above, for a five-tube radio receiver, was made by Bell's "M-4"; the circuit at the right was wired by ordinary soldering methods.

Plane Cage: Using a metal-tipped plastic probe, this Boeing engineer is measuring the charge on a model plane set in a 20,000-volt electrostatic cage.

Static electricity generated by a plane's metal skin can do strange things to delicate electronic instruments. Test readings here will help designers figure out where to locate antennas, sometimes more than 50 of them, on high-speed bombers.

Tornado Chamber: What causes a tornado? In a glass chamber at New York University, Prof. James E. Miller uses swirling currents of air, steam and flame to find out. To create a tornado, he shoots jets of air at a spiraling column of steam.

Much is known about hurricanes from pilots flying through them; but tornadoes arise so suddenly and roar so violently that on-the-spot study is impossible.

Lab Concert: The squeal that comes out of this technician's cello bow will determine whether the turbine wheel under test, part of a Fairchild turbojet engine, will be accepted or rejected.

If the natural sound frequency of a particular blade corresponds to the frequency of forces that may affect it, such as aerodynamic disturbances, the blade will vibrate and interfere with the operation of the power plant.

Standardized Cockpit: Here's what Lockheed's new turboprop transport, the Electra, will look like up in the pilot's "office."

It's a mock-up of aviation's first standardized cockpit. Instruments and controls are laid out in accordance with recommendations by a committee of aviation experts, so that pilots will be able to go from plane to plane, safely and without any need for expensive transitional training.

Science Closes In on the

By Herbert Yahraes

HURRICANE CONNIE had roared and poured its way across Frederick County, Maryland, the night before, and now—on a hot Sunday afternoon—Bob Huebner was out checking up on the damage it had done to his Hidden Valley Farm.

Bob is more formally known as Robert J. Huebner, M. D., chief of the Virus and Rickettsial Diseases Section of the National Microbiological Institute. He is one of the world's outstanding virus hunters.

Virus Hunters at Work

Dr. Bob Huebner (left) discusses with Dr. Wallace P. Rowe the artificial growth in human tissue of a newly discovered cold virus.

Bob's first interest this Sunday afternoon, however, was his corn. Some of it was still standing—eight and nine feet tall—but much of it lay on the ground. The ears, not yet ripe, would fatten woodchucks instead of Angus cattle.

Bob looked at it and turned away. A visitor suggested that sometimes he must get pretty discouraged.

"No," said the doctor. "I have a theory about discouragement. As long as you are able to do something about changing a situation, you don't get discouraged."

Bob, besides his spare-time farming, has been doing a great deal about one of the most discouraging problems facing the medical profession: the cause and prevention of the common cold and related ailments. This block of diseases attacks the average person perhaps five times a year and costs Americans at least two billion dollars annually. Yet medical science until recently had got almost nowhere in its fight against them.

Breakthrough at last. Now, largely because of Huebner and his associates, science has finally made a breakthrough in its long fight against the infections that knock a lot of us out every fall and winter—and sometimes summer and spring

Using convicts as human guinea pigs, a team of doctors headed by a part-time farmer is working on a vaccine like the Salk polio shots.

Common Cold

as well—with sore throats, runny noses, fever and a general wretchedness. He and his team have trapped a whole family of new viruses responsible for many of the illnesses called "a cold" or "a touch of grippe." Further, they have developed a vaccine against one of the family's worst members.

A tragic case of scrub typhus turned the young doctor, recently out of St. Louis University medical school, into a virus hunter. Scrub typhus was one of our big problems in the South Pacific during World War II, and one of the men working on it in 1944, when Huebner returned from serving as medical officer aboard a Coast Guard ship in the Alaska area, was an old acquaintance from medical school, Dick Henderson.

Huebner dropped in to see him at the National Institutes of Health, outside Washington, D. C., and then went on to apply for a research position for himself—preferably in physiology. Nothing was open.

A few months later Henderson caught scrub typhus and died. Huebner was offered his job of research in rickettsial diseases: ailments caused by organisms larger than viruses but smaller than bacteria. "Big viruses," Huebner calls them. The young doctor had no interest and little training in viruses, but he did have three children (now he has eight) and he did want to get into research.

After two years at NIH, and attacks of Q fever and typhus, he decided that the work offered neither fun nor future. But just then an epidemic of a mysterious disease causing rash and fever struck New York City. Huebner got the assignment to look into it.

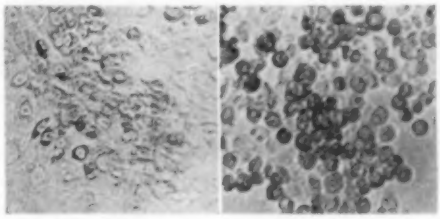
Within three months he tracked down the agent, a rickettsia, causing the new disease, and with Charles Pomerantz, a New York City exterminator, discovered that the agent was transmitted by mites that were living on mice.

This was detective work, and Huebner loved it. Just three years after he had decided the field held no future, Huebner was made chief of his department.

The scene now shifts to the Maryland State Reformatory at Hagerstown, Md. It is 1953, and Huebner has quietly started a virus hunt potentially more important than any of

Raising "Cold Bugs" in the Laboratory

Human tissue is cut into bits to provide a soil bed in which viruses now can be grown in test tubes for study and to make vaccines.



Tissue cells are seen in microscope before (left) and after being attacked by cold viruses.

his earlier ones. This time—working with Dr. Thomas G. Ward of Johns Hopkins, a veteran in the field—he is gunning for the common cold.

One Step Toward a Cold Vaccine

Into the nose of a healthy reformatory inmate, one of Huebner's associates drops a little material from the nose of a young man with a cold. The man with the cold is a sailor at the Bainbridge, Md., naval training station. The inmate is listed simply as G. B., aged 23. He and his fellows have volunteered to serve as guinea pigs in a new effort to pass a common cold through half a dozen groups of persons—to make sure that it *is* a common cold—and then to grow the virus.

Laboratory worker removes APC viruses from bottle in which they were grown on human tissue. The viruses can then be killed with formaldehyde to make a vaccine of the kind Dr. Salk developed for polio.

Earlier investigators had shown that nasal secretions from people with colds do contain a virus. Diluted and filtered through porcelain to remove everything larger than viruses, this nasal material could give healthy volunteers a cold. But attempts to grow the virus outside the human body so that it could be studied had failed.

New method of cultivation. Now you put human or animal cells (a piece of kidney tissue, for example) in a test tube containing a nutrient solution that enables them to live and multiply. Then you introduce the virus. If the cells are the kind it can grown on, it will grow on them in the test tube as well as it can in the body.

This is the famous tissue-culture technique that won Dr. John Enders of Harvard a Nobel prize and enabled Dr. Jonas Salk to grow the viruses used in his polio vaccine.

For his supporting tissue, Huebner and his lab associate, Dr. Wallace P. Rowe, had collected adenoids removed from children in Washington hospitals, had washed them in a germicidal solution to kill bacteria, and had prepared cultures. Then an odd thing happened. The tissue in many of the cultures began disintegrating as if attacked by a virus.

Checking and rechecking, Huebner discovered that the test tubes did indeed contain a virus: a new kind of virus, one that had been in the adenoids to begin with. There were two forms of it. He called them adenoid-degenerating virus, types 1 and 2.

It was on July 13, a short time after these finds, that G. B. was given his cold. Three days later he was sneezing and had a runny nose. The investigators washed out his nose, filtered the material, kept some of it for examination, and used the rest to infect other volunteers.

Now another odd thing happened. Instead of catching an

ordinary, uncomplicated cold, G. B.'s successors came down with fever, sore throat and mild conjunctivitis (an eyelid inflammation commonly called "pink eye") or some combination of these ailments. And their nasal secretions, as well as G. B.'s, yielded a virus almost exactly like the two found in the disintegrating adenoids.

Huebner renamed the new family adenoidal-pharyngeal-conjunctival virus (APC) and designated the newest member as type 3.

It was all very well to discover a new virus, but the important thing was to learn what disease it caused, if any. You could give it to a human volunteer, of course, but you didn't like to do that until you were pretty sure what it would do. That meant finding it under natural conditions.

Hunted new epidemics. Huebner and his associates in the anti-cold investigation let it be known that they were interested in studying "virus" epidemics of unknown cause, and in the summer of 1954 a physician from the Georgetown University of Medicine pointed to one that had broken out in Alexandria, Va., and nearby Fairfax County.

An NIH team hurried into the field. Besides Huebner and Rowe, the team included Dr. Joseph A. Bell, one of the nation's top epidemiologists, Dr. Robert H. Parrott, and Dr. Joseph I. Engler.

The investigators studied almost 400 sick people in their homes and took throat or eye swabs from more than 100. Most of the patients were children, but adults of all ages were included. Some had sore throat, some conjunctivitis, some fever, some had all three. That made no difference. In the great majority Dr. Huebner and his research group found the APC-3 virus.

The doctors concluded that this virus is responsible for a good many cases of "the common cold." Where APC-3 is at work, they suggested that the ailment be called pharyngoconjunctival fever.

But the symptoms are not very clear-cut. Your sore throat may be pharyngoconjunctival fever, or it may be some other type of cold. To tell for sure, the doctor would have to isolate the virus, and by that time you would be well.

But APC-3 is not just of scientific interest. Once you have isolated a disease-causing virus and can grow it in the laboratory, you can probably develop a vaccine against it. That's what Huebner and his team seem to have done.

[Continued on page 278]

Scientist at Home

Dr. Huebner, one of the world's great medical detectives, examines hurricane-battered corn on his Maryland farm.

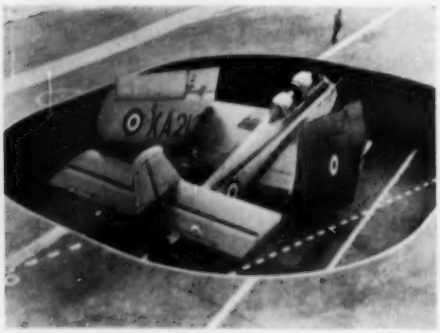
The virus hunter poses proudly with Mrs. Huebner, an ex-nurse, and their eight children, ages one to 14.

Gas Tanks Get Bouncier

TANKS like this one, of synthetic rubber reinforced with nylon, will carry fuel for the new 100-passenger Britannia airliner. Flexible tanks, say British experts, are less likely than rigid tanks to burst and catch fire in a crash or forced landing.

Turboprop TV Catches Ice Show

A SPRAYING device (lower picture) helped ice up a Bristol Proteus turboprop engine during flight tests, while engineers watched the effect on its performance by means of a TV camera mounted in an engine nacelle. What they saw is shown in the top picture.



British Try Cut-Rate Fighter

AN ECONOMY plane, the British Seamew (left) costs only two-thirds as much as comparable antisubmarine fighters. It can take off from the smallest merchant ships or air strips. The plane is shown being lowered into a hangar under a carrier deck.

Tiny Eye Blinks Fast

THE Bolsey 8 (below) is the smallest movie camera in the world, says the Finetta Company of Goslar, Germany. It weighs 13 ounces and holds 22 feet of 8-mm. film. Its shutter blinks at speeds ranging all the way from 1/40 to 1/600 of a second for either serial or single shots.

Stove Burns Up Odors

RAISE the top of this electric stove and you'll see an Oxycoil—a coil of fine wire coated with a chemical catalyst. What's it do? Oxy-Catalyst of Wayne, Pa., says it lowers the point at which smoke, grease and odorous substances will burn. The result is odorless cooking.

Tote TV Is Here

TELEVISION men have finally done what everybody knew they would: made a self-powered portable set. This one, by Ecko, London, England, has a nine-inch screen and works by either battery or house current. It weighs 30 pounds, costs about $168.

'Ontos' Packs Six-Gun Punch to Support Marine Landings

MARINES hitting the beaches on future amphibious landings will have a brand-new weapon to give them close-in fire support. It's Ontos (Greek for "the thing"), and it's made up of six 105-mm. recoilless guns mounted on a lightly armored antitank vehicle. Allis-Chalmers, La Porte, Ind., will make the leatherneck beach-busters.

Carronade, New Inshore Fire-Support Ship, Goes on Sea Trials

THERE'S not much aft on the USS *Carronade*, but the foredeck bristles with the rifles and rocket throwers it needs for its mission: inshore fire support. Vessels like this one will replace the World War II rocket-firing landing ships, which have previously contributed fiery support to troops during amphibious assault operations.

Marines Try Lightweight Pack

BECAUSE ground troops may ride into their next war in helicopters, the Marine Corps is trying out lighter combat packs. Low man on the seesaw above is weighted down with the 58 pounds of gear carried ashore by assault marines in World War II. High man (same weight stripped) carries an experimental pack weighing only 18 pounds.

Flying President Gets Copter

THIS Bell executive copter can carry three in its plush cabin. It's painted in the national colors of Colombia, and will be flown by Gen. Gustavo Rojas Pinilla, president of the country. The craft has a speed of 100 m.p.h., a range of 200 miles and a high enough ceiling (14,800 feet) to churn over most Andean peaks with ease.

Fenders Snap Back After Bumps

ENGLISH truckers are experimenting with fenders that bounce back into shape when crumpled or dented under impact. Lighter and cheaper than steel fenders, they're made of rubber and coated with a flexible paint that matches the color of the truck body and gives the fenders a glossy finish.

Stethoscope Tunes in Termites

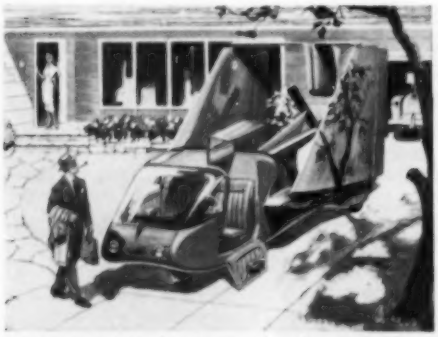
Now exterminators can "tune in" on termites with an electronic instrument devised by a University of California at Los Angeles entomologist. A needle-like probe pushed into the wood picks up the noise of the destructive insects at work. Craig Electronics, Los Angeles, sells the detector.

Four passengers are no squeeze in the roomy cabin of Coleman's delta-wing pusher plane.

Pogo Pilot Designs Air-Sea-Land Sedan

THE novel private plane shown in these sketches was designed by J.F. "Skeets" Coleman, test pilot of the Navy's vertical-takeoff "Pogo" fighter. A prototype is now being built at Del Mar, Calif.

Although a 215-horsepower engine will push the 2,500-pound Aeromarine at better than 200 miles an hour in flight, the pilot will have to be satisfied with a 50-mile top when driving it as an automobile. The delta-wing shape offers exceptional stability in the air.



WINGS FOLDED, the Aeromarine becomes a car, as shown above. Power is fed to the two rear wheels of the tricycle landing gear, and the front wheel is steerable. For water landings and takeoffs (right), there will be a hydro-ski mounted under the plane's watertight hull. Both ski and wheels will retract in flight.

Dream Kitchen—No Bend, No Stretch—Almost Runs Itself

There's no bending or stretching in General Motors' Kitchen of Tomorrow: The housewife waves her hand to answer the phone, touches a control bar to raise or lower refrigerator doors, pushes heavy objects around the room on a tray hanging from tracks on the ceiling. The desk (right) is her intercom center. On the swiveling TV screen she sees, by means of cameras mounted about the house, what's going on in other rooms.

Fire-Alarm Phone Gives Direct Line to Headquarters

This young lady is using a new kind of emergency phone to put a call straight through to the fire department without dialing or waiting for an operator. The new system of getting a direct line to your fire chief was developed by Bell Telephone Laboratories. It is expected soon to replace the old fire-alarm boxes in Indianapolis, Miami, Syracuse, Omaha and Sioux Falls.

When you lift the receiver, a light flashes on a console at fire headquarters, giving them the location of the phone; and an automatic recorder begins to take down your message. The same phone can be used to get the police, too. All you do to get at the phone is to fling back the spring door of the aluminum housing. The door is painted bright red.

New Ideas
FROM THE INVENTORS

1 Cot to Form Its Own Tent. Lighter and less bulky than a separate cot and tent, this enclosed bed would serve campers who like to sleep under cover off the ground. Flap windows—covered with insect netting in season—would provide protection as well as ventilation. Equipment could be stored in the cot during the day.

2 Clock to Tell When It's Wrong. If a nighttime power shutoff stopped this lighted-dial electric clock, you'd know it even in the dark. A current failure would trip a switch. When current came on, a colored bulb would glow until the hands were reset.

3 Ash Tray to Douse Stubs. You wouldn't have to worry about smoldering cigarette butts if you had this ash tray in your car. A fire-extinguisher cartridge in the tray would squirt the cigarette tip when you pressed it down on the crushing pan.

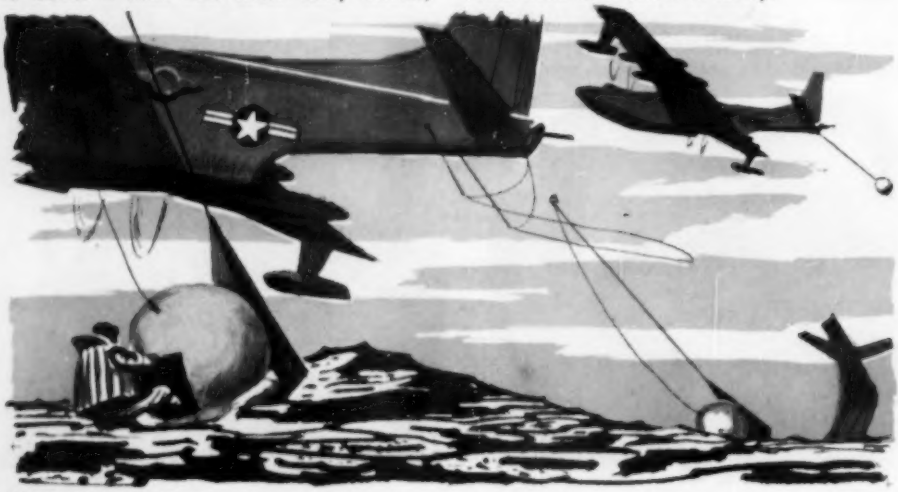
Please turn the page for more new ideas

MORE New Ideas from the Inventors

4 Valve Cap to Warn of Low Tires. This GM-assigned patent valve cap would tell you at a glance when a tire needed air. It would screw onto a valve stem, and tires could be inflated while it was in place. If pressure dropped, a calibrated spring would expand and let a colored indicator move into view behind a transparent window.

5 Hanger to Straighten Picture. This pendulum-type bracket would automatically straighten a picture or mirror that got joggled out of line. Attached rigidly to the picture frame's back, the bracket would be hung loosely on the wall from a single nail or screw. The pivoted bracket's centered weight would level it and the picture.

7 Shell to Speed Air Rescue. Planes that can travel farther and faster than helicopters might take part in rescue operations with the aid of this man-carrying sphere and its hook-tipped pick-up pole. The buoyant capsule would have a hatch large enough to admit a man and could carry heater, radio or other needed equipment. Whether the sphere were dropped at sea or parachuted to earth, its weighted base would cause the pole to slant upward. A spread-out line lowered from a plane would sweep over the pole to engage the hook. The shell could then be hoisted to safety.



6 Tray to Mind the Phone. Do you ever wonder if a call you were expecting came in while you were away from the phone? This tender might set your mind at rest. You'd place a bell-in-phone handset alongside it, and balance the pointer. If the phone rings, the vibration would move the pointer. The tender would double as an ash tray.

8 Razor to Lather Your Beard. After being dipped in the suds, this razor attachment would roll a coat of lather onto your face. You'd then flick the roller to a lower position and shave as usual. It's claimed the roller would improve your shave by stretching the skin ahead of the blade.

9 One-Hand Grip to Control Camera. A photographer could get his picture with this camera even if he had to climb a pole to do it. He could steady himself with one hand to shoot over a crowd or other obstruction, since he'd only need one to hold this box by its grip. Dials and releases near his thumb adjust speed, focus and exposure, and set off the shutter and flash.

U.S. patents on these inventions have been granted to: 1. A. B. Butterworth, Newport News, Va.; 2. T. Conradt, Owego, and F. K. Freudorfer, Endicott, N.Y.; 3. R. S. Haner, Coeur d'Alene, Idaho; 4. E. F. Riesing, Dayton, Ohio; 5. W. P. Halvorsen, Red Wing, Minn.; 6. G. O. Erickson, Inglewood, Calif.; 7. R. B. Cotton, Wilmington, Del., and D. B. Doolittle, Media, Pa.; 8. F. Schallgruber, Bogota, Colombia; 9. J. H. Kindelberger, Pacific Palisades, Calif.

Mammoth C-124 Globemaster was home for these 90 paratroopers during 9,000-mile, 50-hour

Biggest Airlift

PSM photo-reporter takes you on one of the 43 huge flying troopships that moved 7,000 men 18,000 miles in 10 days.

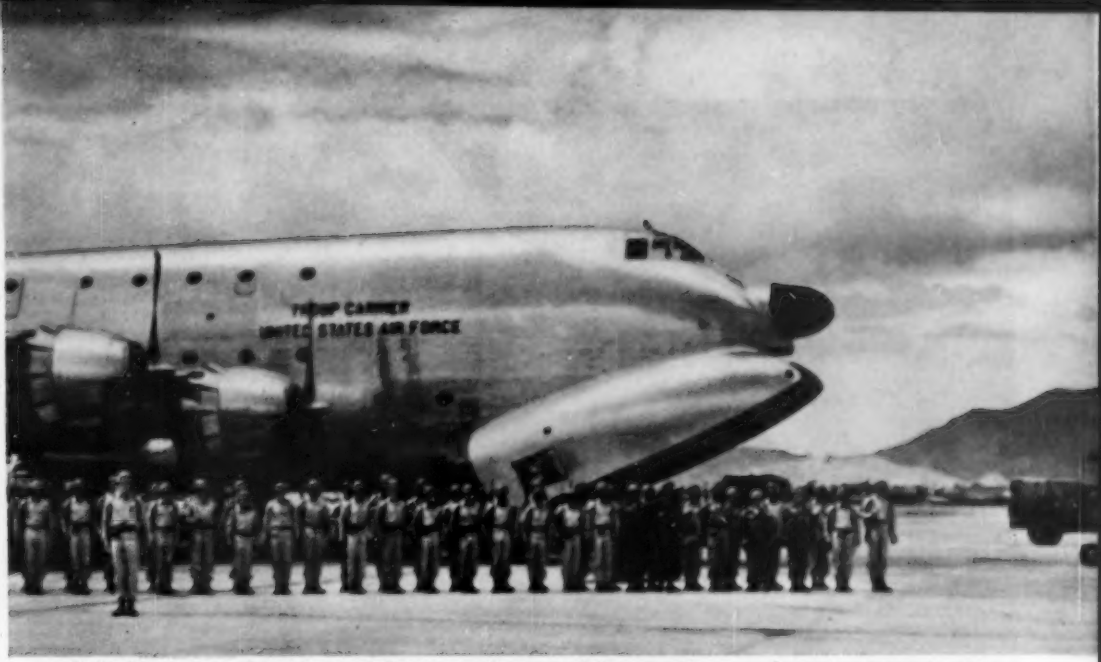
By W. W. Morris
PHOTOS BY THE AUTHOR

I'VE been traveling with an army that moves in an airplane's belly.

As a guest of the Army and the Air Force, I was able to take part in the biggest airborne movement of troops in military annals: the peacetime transfer of more than 7,000 paratroopers and their equipment over a round-trip route that covered better than 18,000 miles between the U.S. and Japan. The object of the mission was to airlift 3,800 "Red Devils" of the 508th Airborne Regimental Combat Team to Japan and to ferry home 3,200 men of the 187th ARCT, which the 508th was replacing. The 187th—known as the Angels from Hell—had recently completed five years of duty in the Far East, including combat in the Korean War.

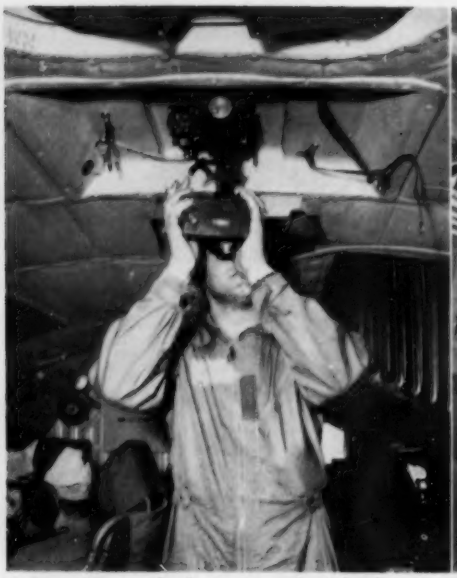
A steady stream of big Globemaster C-124s, each carrying approximately 90 men and seven tons of their gear, leapfrogged across the Pacific both ways to complete the entire transfer in 10 days.

The big, whalelike planes began tak-



flight from Kentucky to Japan. The map at bottom of the opposite page shows two-way air route.

After a hot meal at one of three brief stopovers, men boarded plane carrying in-flight lunches.



NAVIGATOR took frequent celestial observations during flights over the vast Pacific. Airborne radar warned pilot to skirt turbulences; surface ships provided radio checks.

TUNNELS extending into the wings enable engineer to crawl out and service faulty engines in flight. Electronic engine analyzers automatically detect and locate trouble.

Three bunks at rear of flight deck give crew members a chance of forty winks on long hops.

ing off from the airfield at Fort Campbell, Ky., at just one minute past midnight on G-Day. From then on, a plane took off every two hours and landed in Japan approximately 50 hours later. With time out for fueling stops in California and Hawaii and Wake Island, the actual flying time from the Kentucky airfield to Japan was about 43 hours.

I was in the fifth Globemaster to roar down the runway. It was exactly 8 a.m. As the pilot banked the big ship and circled the field before heading for Travis Air Force Base in California, our first fueling stop 10 hours away, I looked out of one of the porthole-like windows. Down on one of the long runways I could see the long line of 38 other Globemasters waiting their turn to load and take off at two-hour intervals.

Once in the air, the men soon had peeled off their summer uniforms and put on fatigues. As the air miles ticked off at about 210 an hour, they played cards, they read, and they napped, stretched out on the floor or curled up on the bucket seats. Many spent an hour or more buffing their paraboots and polishing brass belt buckles and insignia.

This polishing routine had me a bit puzzled until just before we landed, on time, at Travis Air Force Base. Shedding their rumpled fatigues, the men put on their summer uniforms again. When they deplaned, and formed up to march to the mess hall for a hot meal, they were as trim as any bunch of paratroopers I'd ever seen in spite of a 10-hour plane ride. There wasn't a wrinkled uniform, a scuffed boot, or a dull piece of brass on the whole lot. As one sergeant put it when I kidded him about the "spit-and-polish" routine, "Who ever heard of a wrinkled paratrooper? Man, we even have creases in our pants after we make a combat jump."

Two hours later, we were in the air again with a new flight crew guiding our big Globemaster toward Hickam Air Force Base in Hawaii. Being a nighttime flight that wouldn't put us down on the islands until early morning, the men lost little time changing into their fatigues

HELMETS BECAME BASINS for washing and shaving in spruce-up spurts before each landing.

CARD PLAYING helped pass the time for many. Others read and some just slept or talked.

BOOTS AND BRASS were polished to a mirror finish during long hours over the Pacific.

Slow Japanese train took men to new bases.

Paratroopers grouped around the lead Globe-

again and bedding down. Some liked the floor, some preferred the bucket seats. The trick of sleeping safely on the bucket seats, I found out by experience, was to hook one arm through the webbing at the back of the seats to keep from falling off, or being thrown off if the plane lurched or bounced.

Not being too tired, I climbed upstairs to the Globemaster's broad flight deck. Of the ship's seven-man crew—pilot, co-pilot, navigator, flight engineer, crew chief, radioman, and loadmaster—the pilots, the flight engineer and the navigator were the busiest. The loadmaster, having done his job of seeing that the big plane was loaded properly to keep the center of balance within safe limits, was taking some "sack time" in one of the bunks behind the flight deck.

On overnight pass, soldiers visited Tokyo.

Long before Hawaii was sighted the next morning, the men were up, shaving, and dressing. When we landed at Hickam, they were a spruced-up gang ready for the greetings of the hula girls who were on hand to welcome us.

Another two-hour stop and we were on our way to Wake Island. This time we not only had another new crew, but a different Globemaster as well. Our new ship had just been given a complete maintenance check so that it would be ready for the last two legs of our trip. Our original plane, in turn, would be given a complete going-over and be ready as a replacement for some one of the 38 Globemasters that were following the same route behind us.

Some 10 hours later we landed on historic Wake Island, and after another short stopover for food, fuel, and a new flight crew, we were off for our final

[*Continued on page 252*]

master at Itazuke Air Force Base in Japan were the first to take off for flight to U.S.

Back home after a 9,000-mile flight, the paratroopers put on a mass demonstration jump.

Wash Tower Scrubs Big Planes

How do they wash a plane? At Norton Air Force Base, Calif., a giant mobile washing dock stands ready to scrub aerial giants like this C-124 when they come in for periodic checkups. Norton runs the largest aircraft hospital in the world. After the bath, the plane moves on to the repair hangars for an engine overhaul and structural checkup.

Tiny Sub Joins Britain's Navy

THIS baby is one of the British Navy's new Shrimp Class submarines. Four of the 54-foot midgets have been built so far. The *Stickleback* is powered by a diesel-electric engine and is manned by a crew of only five specially trained submariners: the captain, first lieutenant, engineer, engine-room mechanic and an electrician's mate.

They Say Now ...
about space travel

DARRELL C. ROMICK, GOODYEAR AIRCRAFT CORPORATION: "*Space flight is now at a point corresponding to that of aeronautical science in the opening years of the twentieth century.*

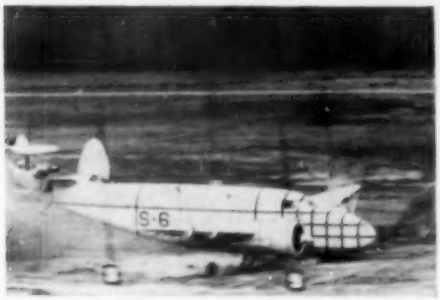
PROF. MARTIN SUMMERFIELD, EDITOR, JET PROPULSION (journal of the American Rocket Society): "*The first launchings [of U. S. satellites] may well take place from an established long-range proving ground such as that off the Florida coast.*"

DR. R. TOUSEY, U.S. NAVAL RESEARCH LABORATORY: "*The satellite should be easily visible with a binocular when the sun is more than five degrees below the horizon . . . The satellite will cross the field of the 7 x 50 binocular in five seconds, if it is at 200 miles altitude. Therefore, a sharp watch must be maintained.*"

J. GORDON VAETH, OFFICE OF NAVAL RESEARCH (in *200 Miles Up*, a book on rocket exploration of the upper air): "*A very genuine possibility exists that the moon and other celestial bodies may be radioactive as a result of direct bombardment by primary cosmic radiation . . . [This] should be thoroughly investigated before any lunar expedition or interplanetary flight is undertaken.*"

Old Planes Hurtle to Battered Glory

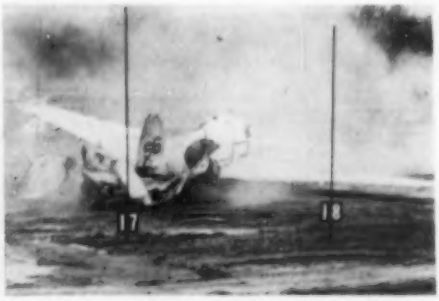
OLD aircraft come to a shattered but useful end at the Ravenna (Ohio) Arsenal of the National Advisory Committee for Aeronautics. Scientists have deliberately crashed 37 service-weary planes in testing how passengers can survive crack-ups. In the Lodestar above, six dummies in the cabin carry sensitive instruments which will register the results of test on both conventional and shock-absorbing seats. In pictures below, the plane is being crashed at 110 m.p.h.



Lodestar speeds toward earthen barrier . . .

. . . hits, and is hurled up in the air . . .

. . . drops, as fuselage starts to break up . . .



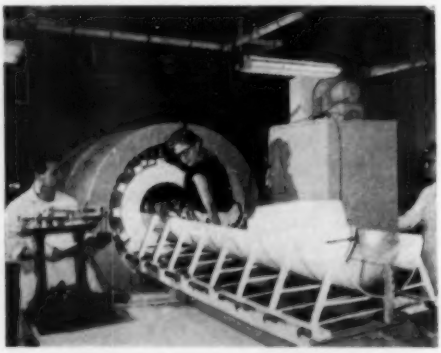
. . . then settles to earth, its last job done.

Lightweight Life Raft Can Save 20 from Ditched Plane

THE inflatable raft above has 20 people aboard; but it's so light, says its maker, Pan Avion, Miami, that a single stewardess could heave it into the sea from a plane. The raft, made of sectional compartments, comes with a light that automatically flashes when it hits the water, a sea anchor and standard survival gear. The raft floats on either side.

Television Chassis Tilts Out

PULL back the vertical chassis of this new CBS-Columbia TV set and it will automatically lock at a 45-degree angle for on-the-spot servicing. Advantage: TV repairmen can work deep inside without dismantling the set, and thus can handle many routine servicing jobs right in your own house.



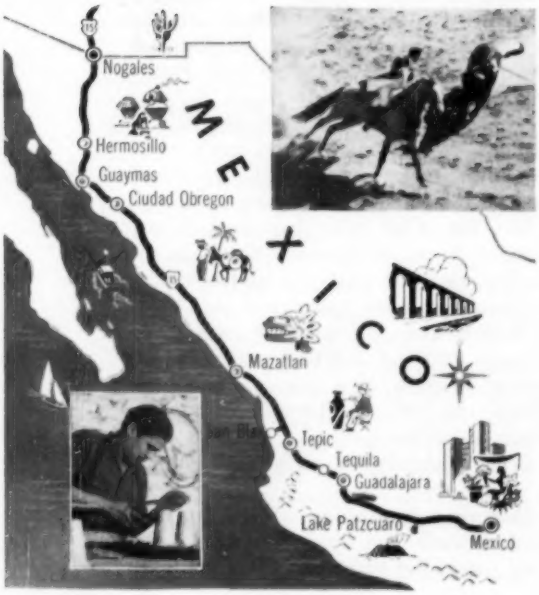
She's Radioactive—Like You

THE young lady in this picture is about to have her radioactivity measured. Technicians will slide her into a new "body counter," which was developed by the University of California's Los Alamos, N.M., scientific laboratory. Every human being is a little bit radioactive, say the scientists.

It'll Mow the Jungle

THIS 60-ton jungle destroyer travels on the largest rubber tires in the world—they're 10 feet high and four feet thick. With its blade raised, the vehicle uproots heavy trees and underbrush with push-button ease. R. G. LeTourneau, Longview, Tex., built the Tree Crasher for land-clearing operations.

Mexico's New Road Lures Do-It-Yourself Tourists



By Darrell Huff

FOREIGN travel! That's what I wanted—a chance to see a bit of the world, to meet people with different customs and a different language.

"Well, why not?" my wife asked.

I multiplied airline or boat fares by two adults and four children.

"We got ourselves a nice house and shop and swimming pool without having any money," she said.

"That's because we built 'em."

"Then why not do-it-yourself travel?"

"A camping trip," I said, catching on fast. "But where to?"

"Mexico!" we both said, and started to dig for road maps.

Mexico's West Coast Highway—Mex-

BROAD AND STRAIGHT, Mexico's West Coast Highway offers more than scenic beauty along its route (map at left). You can see a bullfight for thrills, craftsmen at work for skills.

SYSTEMATIC STOWAGE tucked all this into the trailer—with room left for souvenirs picked up on the way. Surplus duffel bags proved to be the most sensible kind of luggage.

PUTTING UP TENT for the night was a pipe. Eyebolts on the side of trailer hold the poles at left rigid. Ends of crosspieces are hammered flat and drilled to fit over nipples.

ico 15—is the newest major travel route in our hemisphere—and the most exciting tourist news in a long time. Until a year or so ago, it was usable only for a driver willing to gamble on the weather and to put up with jolting, tire-tearing, 20-m.p.h. gravel.

Driving it now is just like home. There's nothing but your own reluctance to miss the sights that keeps you from driving any stretch of it at the legal speed of 100 *kilometros* (62 miles) an hour. It's all paving and it's all good, from Nogales on the Arizona border to Mexico City. And most of it hasn't seen many tourists so far.

It will; it's too good to miss. After Nogales you come to Hermosillo, a city whose name says it is pretty—and it's right. You reach the coast at Guaymas, where the waterfront is lovely and the deep-sea fishing ranks with the best in the world.

You continue south through the most progressive part of the nation, agricultural Sonora, helped by mechanization and irrigation. Stop at the four-block market in Ciudad Obregon, but don't load up with purchases; this is only the beginning, and before you're finished, packing space in both car and trailer will be at a premium.

At Mazatlan you're back on the Pacific. Fishing, views, beaches and lively Mexican life make this destination itself enough for a trip if your time is limited.

But the road goes on, through untouristy Tepic to modern Guadalajara, Mexico's second city and metropolis of the west. You have a choice of side trips: to San Blas on 24 miles of paving cut through brilliant tropical jungle to the sea; to Tequila, near Guadalajara, from which one of the Mexicans' popular drinks takes its name.

From Guadalajara, all Mexico is open to you.

Camping in Mexico now is not only do-it-yourself but find-it-yourself. You keep your eyes open as you drive, wait-

RESORTS ALONG WEST COAST ROUTE are uncrowded, and the weather is warm enough for ocean bathing even in mid-winter. This beach-umbrella house at Mazatlan is made of thatch.

CANVAS SLIPS OVER PIPE FRAME to make a four-sided box shelter. One side is cut to fit the curved top of the trailer and buttons to it with grommets. The front has a zipper-closing door.

FOLDING COT SERVES AS A BENCH for evening camp gatherings before it becomes a bed. In semi-desert country like this, the nights are comfortably cool and crystal clear.

ing for time of day and the right place to coincide. Then you pull off the road into whatever kind of seclusion you've spotted, and there you pitch your tent. You may be in a semi-desert in Sonora, on the beach near Mazatlan or among evergreens in the gentle mountains south of Lake Patzcuaro.

Wherever you are, the predictable weather of Mexico is in your favor. In the rainy season of summer, you know the water will come down at the same time each day, with sun before and after, and you can be prepared. In winter you can count on perfect sunny weather every day.

Gasoline stations are far apart. And you have to keep an eye on the condition of your oil, tires and battery yourself. As the man in the station looks at it, you asked for *gasolina,* so that's what you get. He probably will not pry into the health of your battery, which he regards as your own business.

If you start out with thin tires and insist on exploring gravel side roads, as we did, you may have to replace a tire or two. We did. Your new tire will be made in Mexico, it will be six ply whether you like it or not and the price will be at about the U.S. level.

Most U.S. auto insurance drops dead when you cross the border, so buy some from a Mexican company right away. It isn't cheap, so buy just for the time you'll need it.

It's hard to get lost on Mexican highways; they just go on and on with few paved side roads. But watch closely for tiny *Transito* arrows when you're going through town. If you miss, though, there'll be plenty of local citizens glad to point your way—even before you ask. They know a tourist when they see one.

Such danger points as narrow bridges, curves, grades and populated areas are well marked. For a good distance on both sides of the border, warning signs come as twins, in English and Spanish.

One you'll meet soon and often says

MEXICO DEMANDS A CAMERA to record its colorful variety of places and people. This interior of a cathedral at Chapala was shot without flash (1/25 at f/3.5), using Tri-X film.

CAMPING EQUIPMENT CAN PAY OFF even when not camping. We cooked in our trailer kitchen while stopping at this Lake Patzcuaro cottage to catch up on laundry, baths and schoolwork.

Cuidado con el Ganado. That translates "Watch Out for Livestock," but what it mostly means to the tourist is don't drive at night. Cows, burros, horses and goats wander the roads, and even the best driver can be ambushed by an animal after dark. Besides, you'll see so little if you drive at night that you might as well have stayed at home.

Most camping rules for Mexico are the same as for anywhere else: good light, warm sleeping facilities, refrigeration, some way to cook quickly. We met these needs with the rig you see in our pictures —station wagon, teardrop trailer and button-on tent. For lights we used a hookup to the car battery plus the usual gasoline lantern. Similar lanterns are widely used in Mexico, so there's no problem about fuel or mantles.

Water is probably the biggest problem. The only kind that can be relied upon as safe is the kind that comes in bottles, and this is to be found only in fair-sized cities. To camp comfortably you should figure on carrying about two gallons per person and make sure your supply is replenished daily. Otherwise you may wind up as we did more than once, brushing your teeth with bottled mineral water.

Ice is widely available in Mexico and it's cheap. But don't put it in your drinks. It is made from water you wouldn't drink, and freezing doesn't purify it.

Some kind of icebox, or at least an insulated bag, is good to have. Keep it filled with bottled drinks, which are safe, cheap and much easier to find than pure water.

You'll find splendid grocery stores in the cities, but they won't carry all the things you're used to. Stock up in advance on canned soups if you like them; and try to keep your moving pantry well supplied since distances are long on the West Coast route. Powdered milk is probably the most important single item to keep on hand.

Handy to have. Here are some other things we're glad we took—or wished we had:

Sponge cloths, in different colors for identification, for washing faces and dishes.

Pressure cooker, for tough but well-flavored Mexican beef and for quick water purification at high altitudes.

Big water bag that hung on the outside of the car, taking up no storage space and keeping the water cool.

Aluminum foil and foil pie plates for cooking.

Salt in miniature shakers—less mess if they spill.

Child's broom, a 50-cent item for cleaning camp, car and even clothes.

Short shovel from surplus store, for garbage and latrine duty, camp leveling, emergencies, kids' beach play.

Hatchet and tool kit (including screwdriver, hammer, wrench, scissors and pliers) for equipment repair.

Plastic dishpan of flexible variety. Useful for washing dishes, clothes, car and

[Continued on page 254]

Folks Too Grasping, Tests Show

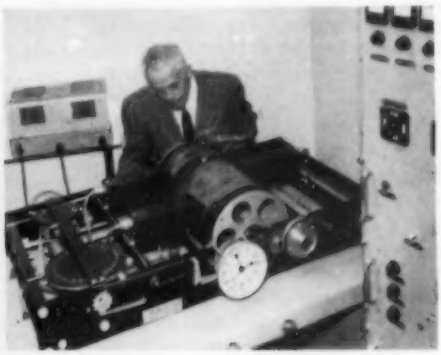
How hard do you grip something to pick it up? Too hard, say engineers at the University of California at Los Angeles. Tests with the setup above show that workmen picking up parts relax somewhat after the first grab but still waste grip force. Gloves increase the energy expended in grasping, as does picking up an object at arm's length.

TV Set Flashes Flight Dope

Four closed-circuit TV sets spotted around the terminal at the Portland (Ore.) Airport give passengers and officials flight information. Arrivals and departures of United Airlines planes are posted on a large panel in the dispatch office. A TV camera, focused on the panel, transmits pictures via coaxial cable to the four receivers in the building.

50-Pound Boat Hits Five Knots

A thousand hours of work went into this model freighter built by Charles Mooney of Columbus, Ohio. Radio-controlled, it is powered by a 20-amp. wet-cell battery and two linked toy-train motors. It has two forward speeds and one reverse, and can attain a maximum speed of about five knots.



This Clock Really Tells Time

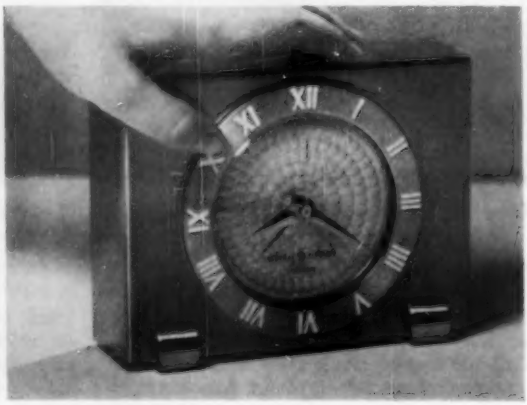
This clock at the Dominion Observatory in Ottawa not only keeps time but also broadcasts it each minute. The voice is on a sound track cut on a strip of 35-mm. film and mounted on a revolving drum. Exciter lamps and photocells keep the voice announcements booming out—right to the second.

New Aids to Living...

Foil Broiler: Deep corrugations and high sides of the aluminum Broil-A-Foil catch dripping fat and prevent spattering. It's large enough to hold a four-pound steak or six to eight chops, and strong enough to be washed, if you wish, for re-use. Trays come packed five in a box.

Rolling Vacuum Cleaner: Big, rubber-tired wheels take the Roll-Easy vacuum anywhere—up or down stairs or in a full circle. It can be guided with the hose or with a steering handle made by fitting the cleaning wand into a plug-in hole on the canister. A foot control on one wheel turns the cleaner on or off when you touch it lightly with the tip of your shoe. The cord, nonkinking, is detachable for easier storing.

Touch-Control Clock: The mere touch of a finger sets the alarm of the Touché at night or turns it off in the morning. The same touch turns the concealed dial light on (as the alarm is set) or off. The clock will be on the market soon.

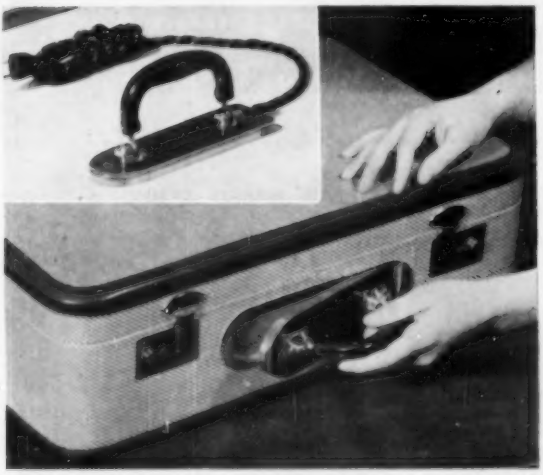


Further information about the products described on these pages can be obtained from the following sources: FOIL BROILER: Manhattan Products Co., 331 Madison Ave., NYC; ROLLING VACUUM CLEANER: General Electric Co., Bridgeport, Conn.; TOUCH-CONTROL CLOCK: General Electric-Telechron, Ashland, Mass.; ROTARY OIL-STONE: Wulff Mfg. Co., Ontarioville, Ill.; DISPENSING BRUSH: Golden Rule Enterprises, 115 W. 57th St., NYC; FIRE ALARM: Cronin-Staples Mfg. Corp., 1514 Park St., Houston, Tex.; IRON-HANDLE SUITCASE: Ann Louise Sales, 215 Ste. Marie St., Manchester, N.H.; BLOW-UP SPATS: Benjamin H. Weiss, Inc., 259 W. 30th St., NYC.

Rotary Oilstone: Hollow-ground knives are sharpened by the Hone-Rite in a bath of oil to give them a razor edge. Guide slots hold the blade of your knife at a preset angle against a small crank-turned corundum oilstone suspended in a pool of oil.

Dispensing Brush: Lather foams up into the bristles when you turn the bottom of the Magic-Wheel handle. It holds enough shaving cream for about 100 latherings. To refill it, squeeze in your favorite cream from the tube. Handle is plastic, bristles nylon.

Fire Alarm: A shrill whistle that should wake even a sound sleeper is built into the Chief. At 156° F., a fusible plug melts and releases a fire-deterrent gas that swirls through the horn. The signal can be heard 500 feet away from the detector, says its maker.



Iron-Handle Suitcase: You'll never go unpressed with this Iro-Case—the handle comes right out to double as a traveling iron. When you arrive at your destination, slip the iron out of its niche, turn the 21-inch case on its side to serve as an ironing board and you're all set to go to work on those wrinkles. The smooth, flat top of the AC-DC iron can be engraved with your name and address.

Blow-Up Spats: These Ankloons make ski boots and skating shoes fit like custom-built jobs. Air pressure fills up excess space so that even loose-fitting footwear hugs the heel and gives you air-cushioned comfort. You never have to adjust shoelaces. The little pump fits into your pocket so you can tighten them up any time with a few squirts of air. The air cushion helps keep your ankles warm, too.

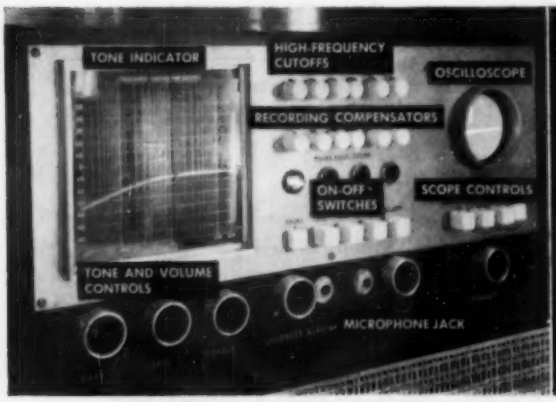
EVERYTHING BUT THE KITCHEN SINK is in this super de luxe job, biggest of a new line of phonographs introduced by the Bell & Howell camera firm. All components, including three speakers (two woofers and a tweeter), are housed in this handsome cabinet, which has a rigid "spine" across the back to prevent reverberation of sound. Price: Nearly $2,000.

PHONOGRAPHS IMPORTED FROM EUROPE are gaining popularity here. Below is a Norelco made by Philips in Holland. It has FM and eight-band AM radio, three speakers, sells for about $1,000.

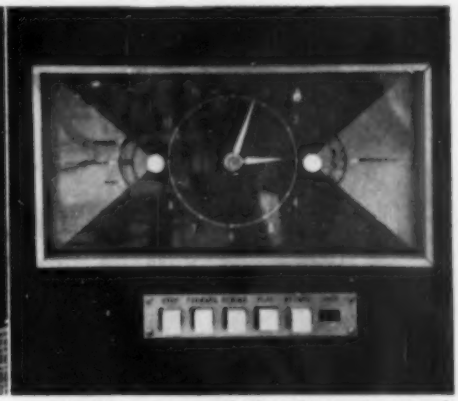
SEPARATE SPEAKER CABINET of RCA Mark I houses 15-inch woofer, five-incher for middle

High-Bracket Hi-Fis Do Everything but Dance

YOU don't have to be an engineer to get a hi-fi system now—you can buy good ones ready to play. But a look at the controls may send you hunting for an electronics handbook. Some have more knobs than a radar set. Here are a few of the newest hi-fis, fully assembled in fancy cabinets (at fancy prices).

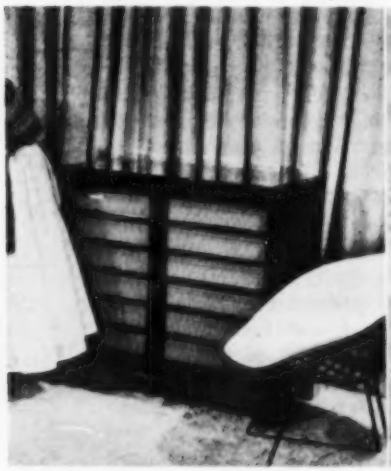


IT WON'T TAKE OFF, though you may wish for a co-pilot. Complex panel includes oscilloscope, and visual tone control that shows graphically how you've adjusted all those knobs.

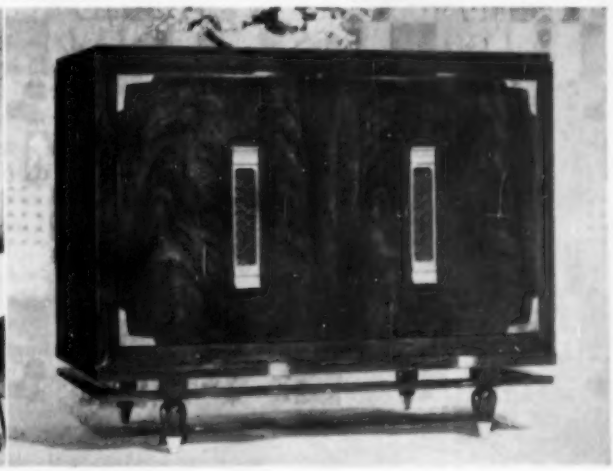


CLOCK, like ones on clock radios, automatically turns tape recorder and radio on and off at pre-set times so you can record shows you might otherwise miss. It tells time, too.

tones, two tweeters. Set uses 20 tubes, one transistor, has AM-FM radio, recorder. Price: $1,600.



ELECTROSTATIC SPEAKER that distributes high tones uniformly around room is used by Philco. Changer handles 14 LP records and affords five hours of continuous music. Price: About $750.



"I know what I want . . ."

"I ain't going to stand for any tinkering around . . ."

GUS

By Martin Bunn

"HOW much would you charge," Silas Barnstable inquired suspiciously of Gus Wilson, proprietor of the Model Garage, "to put a new clutch in my Ford?"

Gus, who was engaged in putting the usual two gallons of gas in Barnstable's dilapidated Ford, could hardly believe his ears. Silas, well known as the town tightwad, usually scrounged worn parts from a junk yard, and either tried to fix his car himself or hired some teen-age kid to do it for him.

"It's about time," Gus said, hanging up the hose, "that you did something about that chatter when you shift gears. Every time you shift, you're in danger of being thrown out of the rig."

"None of your sarcastic remarks," Silas snapped, peering angrily over the tops of his glasses. "What'll you charge to put in a clutch?"

"Depends," Gus told him, "on what's required. I can't give you a flat price until I check over the job."

"Oh, no you don't," Silas said warily. "I'm on to how you garage fellers work. You poke around and hem and haw, and make believe a lot of things need fixing that don't. Time you get done you've chalked up a bill that's worth more'n the car."

Gus was tempted to tell the stingy

"It's none o' your business . . ."

"I was to get new parts . . ."

OBEYS ORDERS

old coot that it wouldn't take much of a bill to be worth more than his third-hand Ford. But he refrained from doing so. He made the mistake of trying to reason with Barnstable, making him more suspicious than ever.

"It's this way, Silas," he explained. "You think that you need a new clutch, and from the way your car acts, undoubtedly you do. But I can't be sure until I check it out. This Ford has gone over a hundred thousand miles—loose and worn universal joint, transmission bearings, drive bushings, and even loose truss rods could be causing your chatter when shifting. Even if you do need a clutch overhaul, the price would depend on how many parts I had to put into it."

"Quit beating around the bush," Silas demanded. "Nobody works on my car until I know what it will cost me. If you won't give me a straight answer, I'll take my business somewhere else."

"All right," Gus said wearily. "A clutch overhaul it is. I'll put in an exchange disk, facing and pressure plate, and it will cost you 28 dollars."

BARNSTABLE rose up in his seat like a hooked salmon.

"What d'ya mean—28 dollars!" he yelled. "That's highway robbery."

The cantankerous old codger shifted into low, roared the motor with a clattering of pistons, lifted his foot from the clutch. The car leaped from the gas pumps with a shuddering and chattering that threatened to shake off its dilapidated, flapping fenders.

"Take his business somewhere else," Stan Hicks said, coming from the grease rack. "I wish he would."

"It takes all kinds to make a world," Gus said amiably. "We might even miss the old man if he didn't come around at least once in awhile."

"Why?" Stan queried. "Occasionally he buys two gallons of gas. In the meantime he fills his leaky radiator and tires with our water and air every day. When he needs oil, he dips it from our waste barrel for free. Most of the bolts and nuts in his old jalopy he filched from our junk box."

"Kind of ingenious character, isn't he?" Gus chuckled. "I wonder who he'll find to put in a clutch for less than 28 dollars?"

Gus didn't have long to wonder. Barnstable made the rounds of the town's garages, and then showed back at the Model Garage, as cantankerous as he ever was.

"I've decided," he

"I'll test it myself."

told Gus, "to let you fix my clutch. But mind you, I'll have my eye on you every minute. So don't try slipping in any beat-up parts."

"I won't," Gus promised. "But you'd better let me check the car over first. It might save you . . ."

"NOW," Barnstable warned, "don't start trying to hornswoggle me again. I know what I want—just see that you give it to me."

"You're the doctor," Gus said grimly. "Back the car under the chain hoist, Stan—I'll get right to work on it."

Gus hooked the back of the chassis to a split chain, hoisted the rear end high. He got under on a creeper, and lay there awhile, looking up at the bottom of the old Ford.

The clutch, he thought, would really have to work smooth on this baby when he was finished with it to make her take off without any chattering.

"I'll bet every bearing, gear and bushing between clutch and rear wheels could stand replacing," he muttered half aloud.

"Well, I wondered where you were gonna find room for that hitchhiker."

GUS's mind went back to depression days, when junk heaps in this condition had been common. He grunted as he began to unhook spring, universal joint and other connections.

He backed the rear assembly out from under, put a jack under the rear of the engine, and removed the transmission. He removed the flywheel housing, prick-punched the flywheel and clutch cover, and eased the pressure-plate tension off carefully by backing off the studs all the way around. Then he removed them and took out the pressure plate and facing disk for closer inspection.

He carried the parts to the bench, with Barnstable trotting at his heels like a suspicious terrier.

"Hm," Gus grunted, wiping a slight bit of moisture from the edges of the parts and smelling it. "You've been squirting gas in here recently."

"It's none o' your business," Barnstable said belligerently. "I'll do as I please with my car."

Gus had a mental picture of Barnstable running around trying to beat down his price, and failing. Then, as a last resort before coming back to Gus, he had squirted gasoline into the clutch in an attempt to wash out grease to stop his chatter. The humorous thing about this was that there was no grease on the clutch facings.

Gus began to inspect the pressure plate and disk carefully for cracks, burns, warpage and adjustment of pressure-plate springs.

"Now look here, Gus," Barnstable protested. "I was to get new parts. I ain't going to stand for any tinkering around on these old . . ."

"All right," Gus interrupted, and moved to draw out an exchange pressure plate and a lined disk from his store in the stock room.

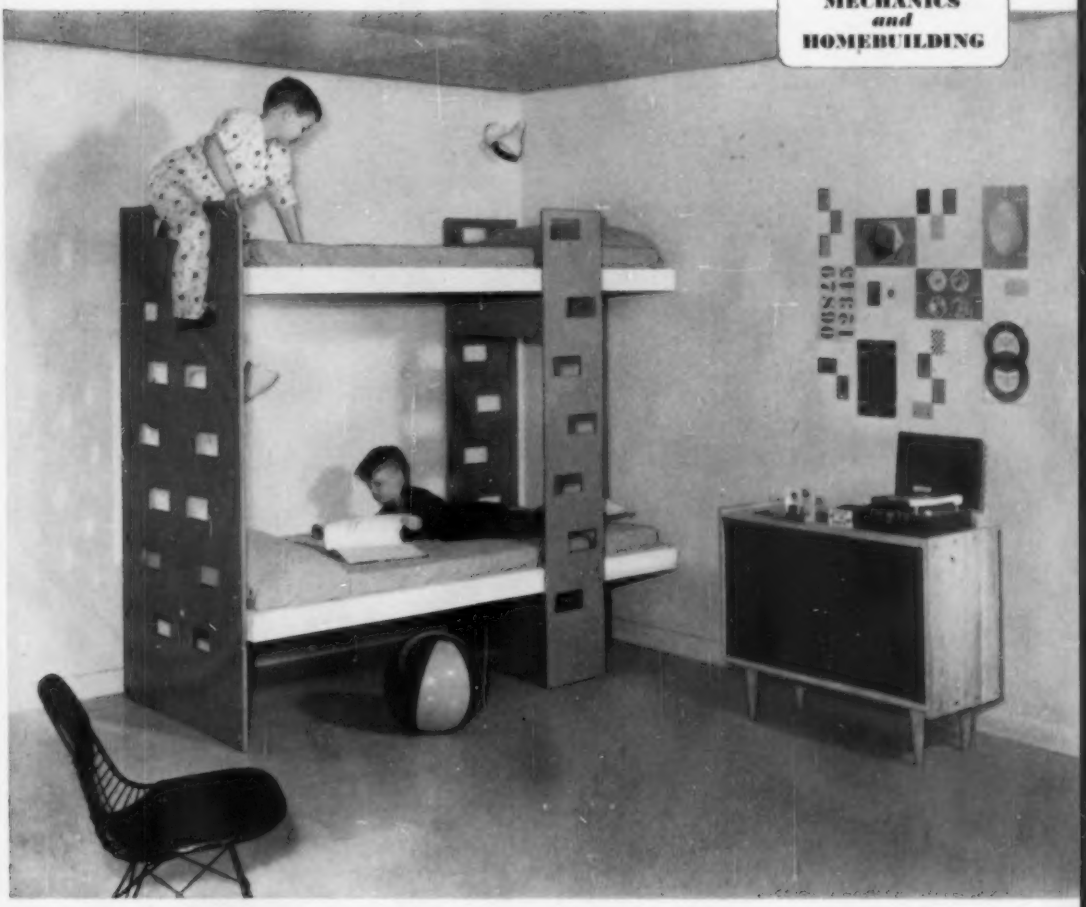
Gus worked systematically to install the parts. In spite of the fact that Silas had insisted that his trouble was caused by a bad clutch, Gus kept his eye open for other easily visible defects, such as loose truss rods and transmission out of line. Gus intended to road-test the completed car, but Barnstable got in it and drove out.

"I'll test it myself," he announced testily as he left with a lurch.

"BROTHER!" Stan Hicks chortled, "I never expected to see the day when Silas Barnstable would pay for a first-class job of repair."

Gus poked thoughtfully at a gob of grease that had leaked onto the floor

[Continued on page 246]



Here's something new:

Fun Furniture for a Child's Room

Two Western designers created it to appeal to young imaginations. It's useful, too—and you can build it.

TRYING to put himself in a child's place, a San Francisco architect took a thoughtful look at the furnishings that youngsters have to live with. At first they seemed pretty good.

But soon, from his newly adopted viewpoint, the architect saw that they lacked something important.

They just weren't fun.

Why, he wondered, couldn't beds, toy

PLAY CONFERENCE is only one of many uses for this sturdy table and chair set. Triangular chairs fit neatly under the table when not doing duty as forts or trenches. Slots make them easy to handle. When it is laid on its side, the table becomes a doll cradle.

chests, tables and chairs serve their purpose—and be springboards for youthful imaginations besides?

From that idea were born the pieces shown here. Designed by John Garden Campbell and his partner Worley Wong, they were shown at the Golden Jubilee Exhibit sponsored by the Douglas Fir Plywood Association at Portland, Ore., last summer. Kids took to them at once.

"The imagination of a child is a great deal more active and alive than his ordinary surroundings encourage," says Campbell.

Operation Imagination. The bunk beds, for instance, aren't just to sleep in. The steps can become firemen's ladders, Jack's beanstalk, or the limbs of an apple tree such as Dad climbed as a kid.

Shallow rooflike structures (Campbell calls them tumblers) serve as tricycle ramps. Two tied together become a tent or garage; three, set on edge, are a spaceship or a submarine conning tower.

STACKED TOY CABINETS become cliffs or skyscrapers; in single tiers, store counters or cowboy corrals. End compartments house trailer trucks. Middle one has door on each side (it's fun to pass things through or, with an accomplice, to make them disappear).

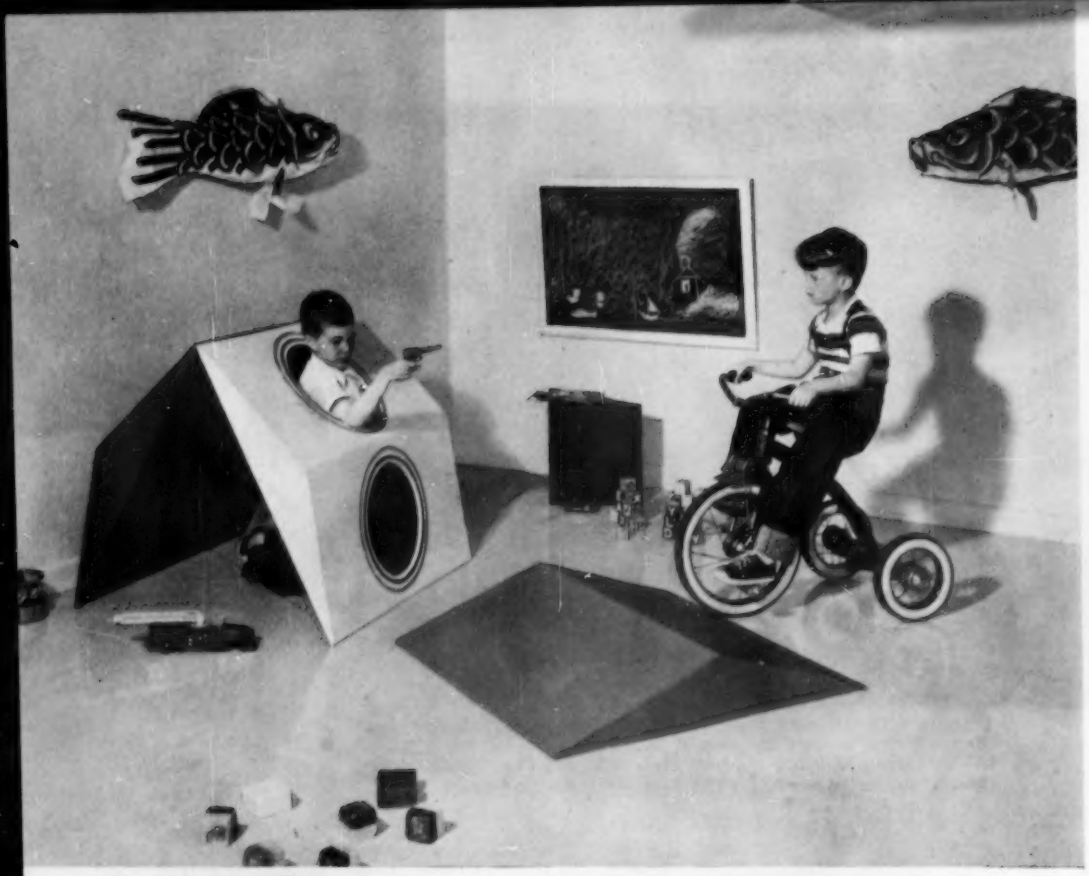
Toy-storage boxes make fine frontier forts (or, in a quieter vein, store counters). Two doors in each open on the same compartment—handy when play calls for a ticket window or ship's porthole.

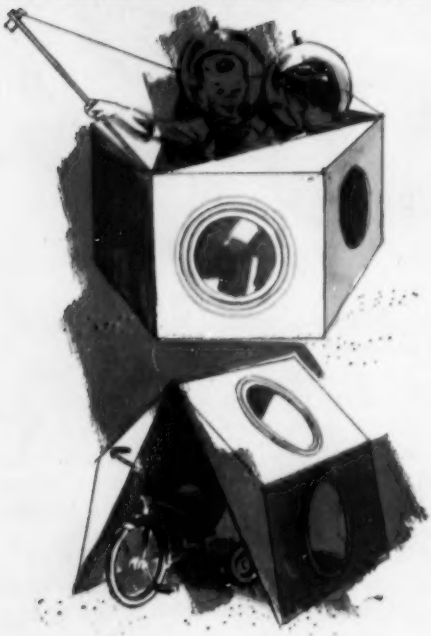
The husky four-seat play table has a broad, nontipping base. But it can be turned on its side for fun. The triangular chairs snug in under the table when not used as king-size building blocks.

Keep them simple. The designers specify plain, solid colors except for a couple of rings painted around the holes in one tumbler.

"The usual stuff in stores," says Campbell, "allows for no imaginational play. If it is a car, it's a car; if a train, it's a train, usually with too many gaudily painted details. Don't overdo decoration—youthful imagery can draw in the right props faster than you can shake a brush."

You can build these pieces from inexpensive fir plywood in time for Christmas. Glued joints assembled with screws



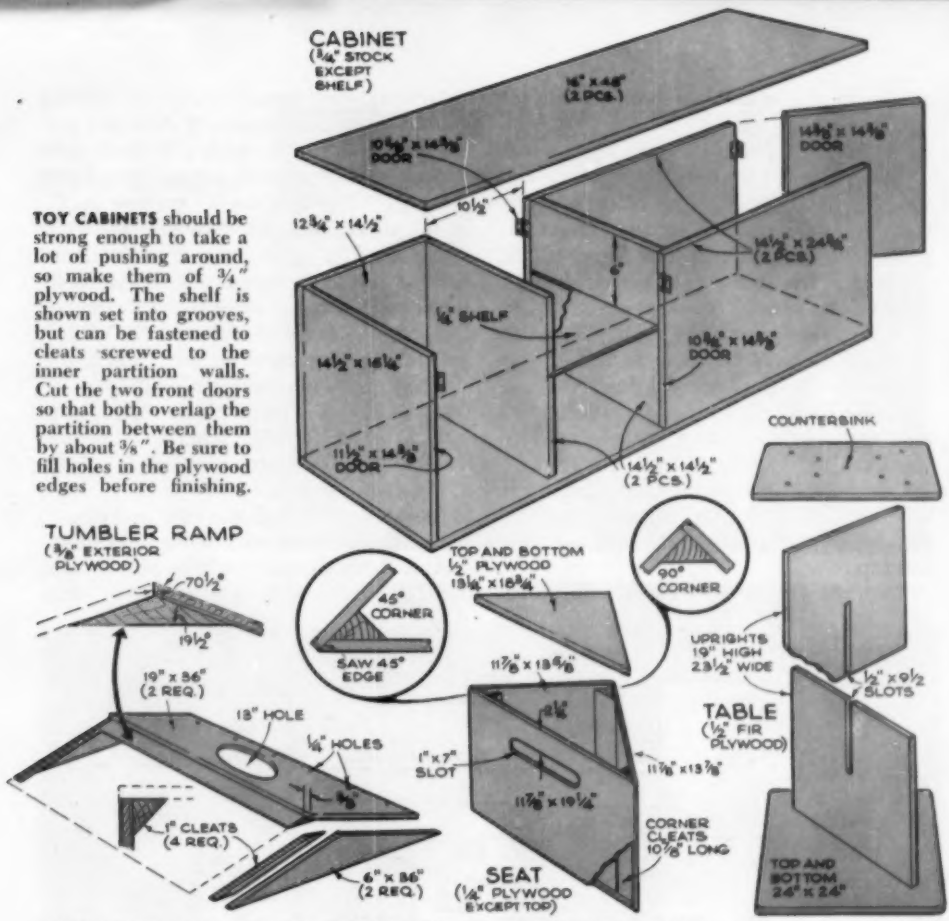


KIDS GET ACTION with these low ramps, whether it's swooping down them on a tricycle or defending a fort (which doubles as a tent or a garage). Set three units on edge, tie on a triangular cover, and youngsters can take off for space or a deep dive under the sea.

or nails make construction easy. Countersink or set such fasteners, fill over them, and sand smooth. Apply resin sealer to close the grain and two coats of enamel.

Toy boxes. Three parts can be cut in pairs: the top and bottom, the large sidepieces, and the two partitions. If you groove the latter for the shelf, be sure to slide it in before you nail on the sides (or, instead of grooves, you can use cleats nailed to the partitions).

Apply glue to all joints and assemble them with finishing nails, setting them below the surface. Cut doors ⅛″ smaller each way than their openings. Piano-type (continuous) hinges are recommended, but cabinet hinges will do. In-



TOY CABINETS should be strong enough to take a lot of pushing around, so make them of 3/4" plywood. The shelf is shown set into grooves, but can be fastened to cleats screwed to the inner partition walls. Cut the two front doors so that both overlap the partition between them by about 3/8". Be sure to fill holes in the plywood edges before finishing.

WATCH YOUR ANGLES to make good joints along the ridge. Set endpieces in flush with edges of the short panels. Cut "portholes" in one ramp.

TO ASSEMBLE CHAIRS, nail the slotted panel to the bottom and to two 45° cleats. Then add the short sides and the 90° cleat.

stall catches to keep the doors shut and gliders to make the boxes easy to slide.

Table and chairs. Cut the table top and base as nearly 24" square as you can get from a 4' panel. The table uprights are also one size. Be careful to cut the slots along the shorter (vertical) dimension. Lay out diagonals on the top and base before rounding the corners. Drill and countersink four holes on each for screws to go into the uprights.

Chair height is held to 11⅞" so that four pieces can be cut across the width of a 4' sheet. Saw the short edges of the large side at 45°. Bore 1" holes at the ends of the slot and cut between.

One of the short sides is longer than the other, which it overlaps at the 90° corner as shown in the drawing. Rip a two-by-two on the diagonal and use one piece as the cleat in this corner. Rip the other piece in half again to make 45° cleats for the other corners.

Cut all corner cleats 1" shorter than the height of the sidepieces so that the top and bottom, cut from ½" plywood, will drop in flush. Assemble with glue and six-penny finishing nails. Round off the corners with sandpaper after the glue has set.

Tumbler ramps. Better make these of exterior plywood—the kids will haul them outdoors at times. Saw one long edge of each panel at 70½° to join along the ridge

piece. In the middle of both panels for one ramp (assuming you make two or three ramps) cut a 13″ hole.

Make the ridge piece from a one-by-six. Rip a 19½° bevel from each edge. Cut this piece short so that the end-pieces set in flush with the panel edges.

Rip the triangular side cleats from 1″ stock, cutting both ends at an angle to fit. Glue and nail all joints. Drill ¼″ holes 6″ apart along both outer edges so that the units can be tied together.

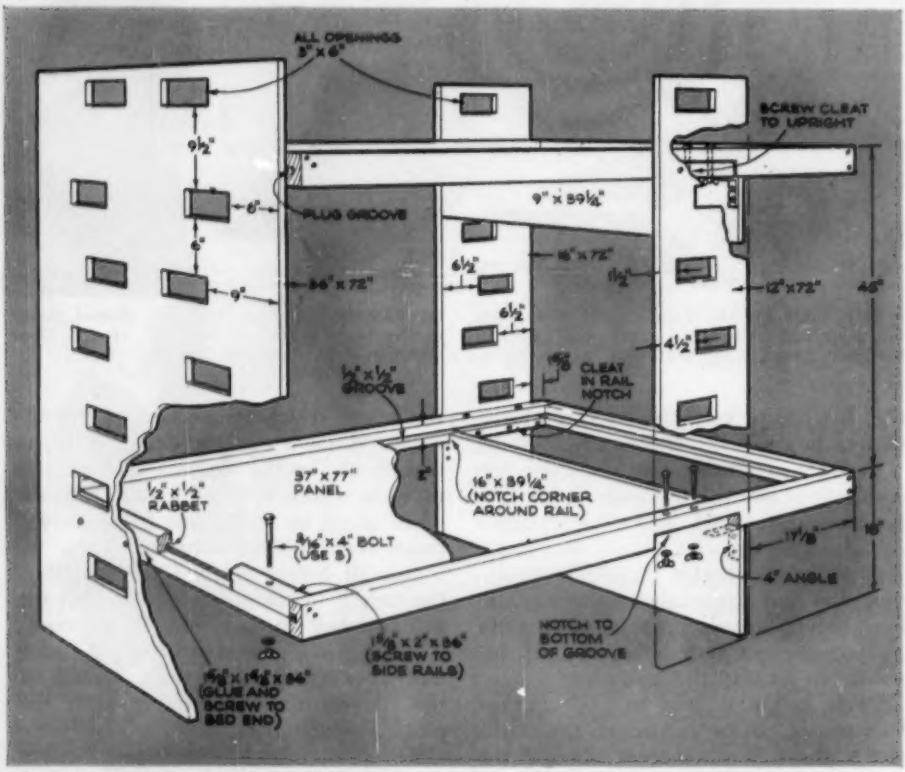
Bunk beds. Cut all parts except the rails and cleats from ½″ plywood. The foot end is a whole 3′-by-6′ panel. Lay out ladder holes beginning 1½″ from the top and 10″ from the bottom, spacing them 6″ apart except the second from the top.

You can cut these with a saber saw or electric-drill attachment or by boring holes at opposite corners of each and cutting out the middle with a keyhole saw.

The mattress panels are cut from 4′-by-8′ sheets. Rip a ½″-by-½″ groove in 2″-by-4″ stock; then cut two 36″ end rails and four 79¾″ side rails. For the front rails of the mattress frames, rip stock 2″ wide and rabbet it as in the drawing.

Before gluing and screwing the frames around the mattress panels, notch the side rails from beneath to take 1⅝″-square cleats. Glue and screw these on the side uprights 16″ and 61″ from the bottom. To the foot end fasten similar 36″ cleats at the same heights.

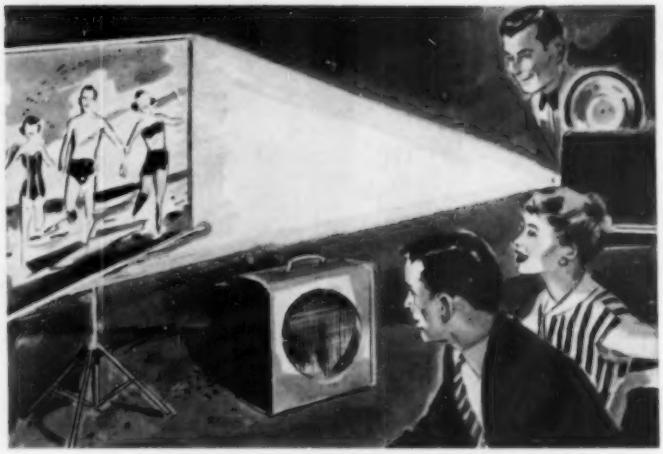
Bore holes through the rails and cleats. Use carriage bolts with wing nuts to assemble the beds, and you'll be able to take them down for moving or storage. END

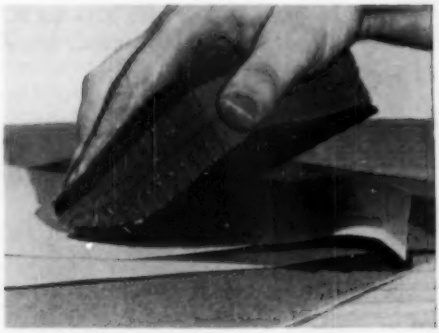


STAIRWAY TO ADVENTURE. A welcome take-off to dreamland, these steps may lead to a spaceship, the bridge of a carrier, or even a secret cavern in the cliffs of "Planet X." Make the top and the bottom mattress frames alike. Two cross panels join the front edge of the 16″ upright at one corner with the rear edge of the 12″ upright, which is set forward.

Move Speaker to Help Sound

PLACING a speaker near the audience may improve the sound of 16-mm. movies by cutting down reverberations. In extreme cases, try putting it right down in the audience. *—C. L. Anderson, Burlingame, Calif.*





Rubber Block Sands Curves

Two small pieces cut from an old rubber kneeling pad make a flexible contour-sanding block. Glue the pieces together back to back with ordinary rubber cement.

Chamfer Sets Molding on Ridge

FLOOR-SANDING machines usually skip edges, leaving little ridges near the baseboards. To fit new molding over such a bulge, chamfer the inner corner of the stock.

Rubbing Helps Match Fitting

MATCHING a fitting is easy if you have an exact pencil rubbing to take with you. Lay a piece of paper on the fitting and rub over it with a soft pencil.—*Walter E. Burton, Akron, Ohio.*

Old Veneer Repairs Itself

TINY bits of veneer needed to patch an old clock or antique can be cut from under a button, molding or other decoration on the same piece. Be sure to cut away only as much as the decoration covers.

New for the Handy Man

1. Marble Table Is Precut. Screw the legs into a composition-wood base (inset), lay on the marble slab and you have a marble-top coffee table, 22″ by 41″ by 15″. The legs come in various wood finishes or in brass, and extend either flared or straight.

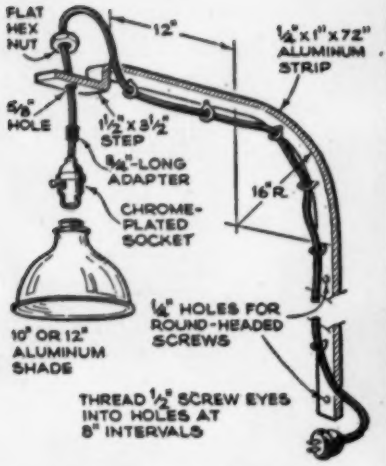
2. Tape Holster Fits on Belt. Save wear on your pockets by carrying a fabric or steel tape in a lightweight holster that slips on your belt. The holders take ¾″-by-8′ and ⅞″-by-10′ tapes. They're made of cowhide and riveted for extra strength. The opening makes it easy to pull the tape out for immediate use.

4. Putty Fits Sash. The triangular opening of this tube releases putty shaped to fit right into the angle between a window sash and the glass. It holds 150″ of putty and comes separately or with a kit that includes the putty knife and glazier's points.

3. Storm-Sash Catch Lets in Air. Flip open this storm-window catch and it pushes out the sash for a breath of air, yet braces it securely against winds. Closed, it holds the window tightly under tension, like a trunk latch. An extra half bracket is included for a screen sash so that it can be used with the same sill section.

5. Kit Reproduces Colonial Table. For the first time, Colonial Williamsburg offers a kit from which you can build an exact facsimile of an 18th-century table that was once used in the Wythe House there. The table has a maple base and pine top. It is 24″ high, 22″ wide and 16½″ deep. It comes ready for assembling and finishing.

Further information on the products shown on this page can be obtained from: 1. Fred. Rolla Marble Works, 1251 Riverside Dr., Los Angeles; 2. Bauer-Lee & Co., 140 E. Montecito, Sierra Madre, Calif.; 3. Treco Products Co., Inc., Bayport, Minn. 4. Goodell Co., Main St., Antrim, N. H.; 5. Colonial Williamsburg Craft House, Williamsburg, Va.



You Can Make This Overhead Aluminum Lamp in an Evening

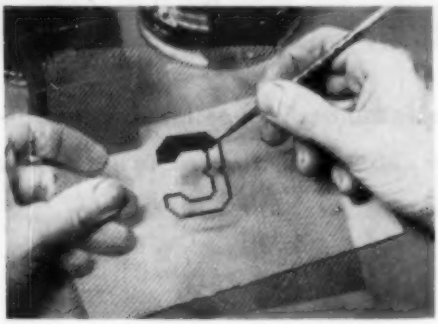
A STRIP of aluminum, a light socket and an old photo reflector make this attractive study lamp for a den or child's room. Bend the bracket from a 6′ length of ¼″-by-1″ aluminum. Drill seven undersize holes for ½″ screw eyes at 8″ intervals, starting 1″ back from the step that supports the socket. Thread the screw eyes into the soft metal, then back them out and file off the tips so that they will not project beyond the metal when they are reinserted.

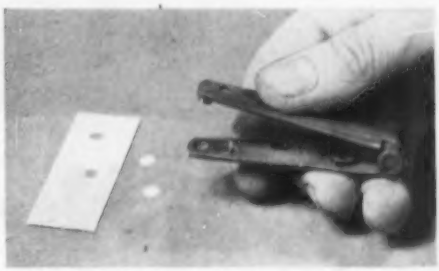
Drill a ⅝″ hole through the center of the step for a ⅝″ pipe nipple. Thread half of the nipple into the socket, pass the other half through the hole in the step, and secure it with a flat, hexagonal nut. Thread the cord through the screw eyes and down through the nipple to the terminals in the lamp socket. Use a chrome-plated socket, to harmonize with the aluminum bracket and the photo reflector.

Fasten the bracket to the wall with round-head screws passed through ¼″ holes drilled through the aluminum. For a firm grip in plaster walls, use small toggle bolts.—*Wyeth Kidwell, Willoughby, Ohio.*

Painted Screen Shows Figures

YOU can form neat figures for house numbers by filling in spaces in ordinary wire window screen with opaque lacquer or paint. Placed in front of a light-colored background or illuminated panel, the painted-in screen numbers will show up brilliantly.





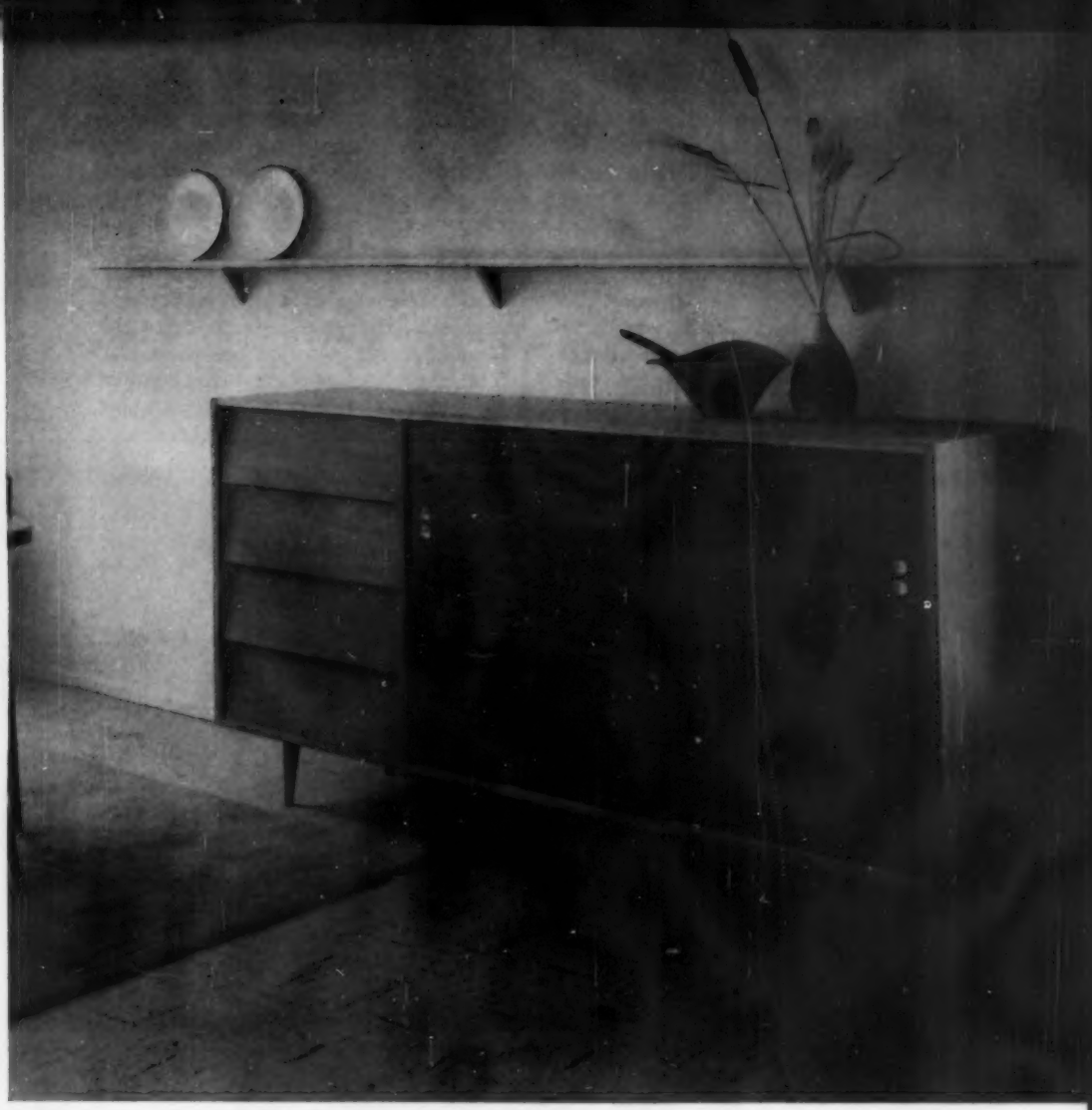
Strap Hinge Packs a Punch

MAKE your own eyelet punch from a strap hinge. Drill holes through the tips of both leaves and drive a piece of drill rod tightly in one. Hammer the hinge loops to pinch the looseness out of them. To form self-opening jaws, rivet a short compression spring to one leaf. File the remaining hole smooth.—*Walter E. Burton, Akron, Ohio.*

How to build

A top designer shows you how to combine new cabinetmaking tricks with old, for furniture your family will treasure.

By Frank Dorr



good furniture

IN THE picture above you see a dining room of superior furniture—the kind that stores unblushingly tag at $1,000 or more. But you can build these pieces with home shop tools.

Created especially for POPULAR SCIENCE MONTHLY by an outstanding young designer-craftsman, Martin Stan Buchner* of Whippany, N. J., the table, chairs and server show what makes good furnture good.

They look good. Their spare, light style is today's classic, carrying forward the great heritage of Early American and Shaker furniture makers. They will make

*Martin Stan Buchner, winner of many design awards, is a founder and leading member of the New Jersey Designer-Craftsmen, a group fostering good contemporary design. His Buchner Co., furniture designers, is at Route 10, Whippany, N.J.

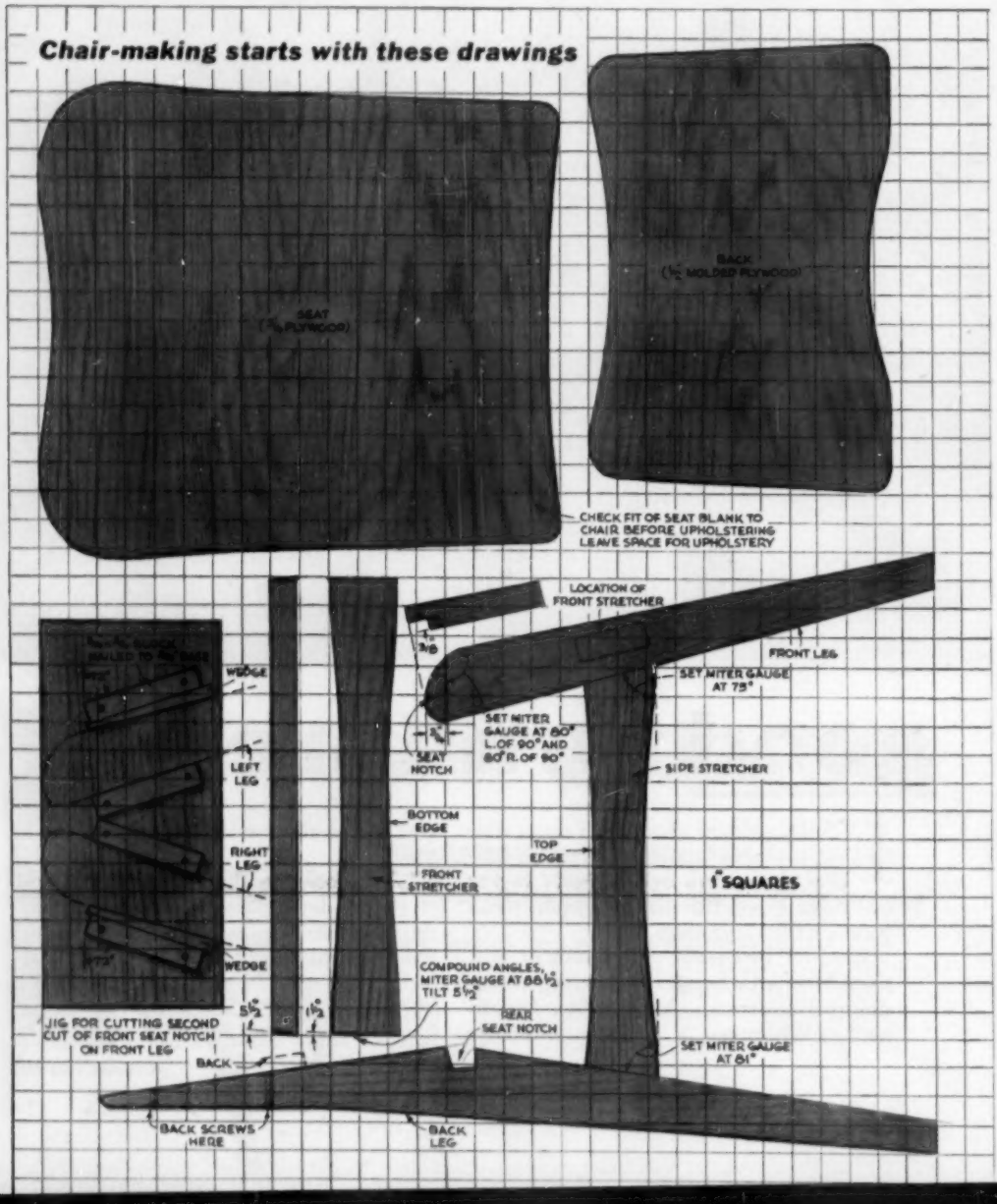
a proud display in any home of taste—already the PSM server has been exhibited at the Museum of Art in Newark, N. J.

They are structurally good, built solid for practical everyday use by you and your children and possibly your children's children. The chairs fit you. The table holds rock-steady while you carve the roast. The server, with unique doors that glide at a touch, is efficiently compartmented for dining needs.

The PSM furniture meets one more requirement: construction that knowing amateurs can duplicate. Buchner built these pieces with power tools common to most well-equipped home shops. He used a bandsaw, table saw, drill press and portable drill, plus ordinary hand tools.

Take the chair, which is detailed here. (We'll tell you how to make the table and server in following issues.)

The chair back is curved—for comfort and appearance but even more for



strength. It is so strong that it is joined to the uprights by just four screws.

You mold this shape yourself, using a simple technique—borrowed from the aircraft industry—as new as the chair design itself. It will prove useful for many other shop projects.

You start with ⅛" three-ply plywood (which bends readily), glue four blanks together, and clamp this sandwich in a jig Buchner has devised (shown in the photos and drawing below). The result is homemade ½" plywood, curved to the shape you want.

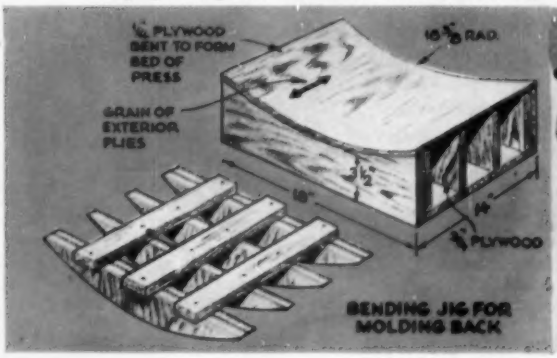
The ⅛" plywood is widely available in a variety of woods. However, if you can't find just what you want to match the solid legs and stretchers, you can add veneer facings to the chair back. You do this in the same way and with the same jig as shown for veneer-face plywood. It will take more time, though, and calls for careful handling of the delicate veneer.

Take a close look at the chair seat and

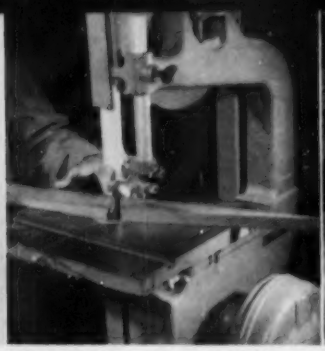
HERE'S HOW YOU MOLD PLYWOOD: Cut ⅛"-plywood blanks oversize. Apply resin glue (such as Weldwood or Cascamite) to the surfaces with a notched spreader. Stack the blanks with the grain of the outer veneers running in line with the desired curve, and the grain of the inner blanks at right angles. Sandwich the assembly between two protective sheets of scrap plywood and clamp it in a bowed jig overnight. Once the glue sets, the shape is permanent.

JIG FOR THE CHAIR BACK is made from ¾" plywood scraps. For mating curves, stack and nail uprights together and make one bandsaw cut.

LAY THE CHAIR-BACK PATTERN on the concave face of the molded plywood to trace the outline. Use a medium-fine jigsaw blade for the cut.



1 MAKE LEGS AND STRETCHERS by first tracing patterns on hardwood stock dressed to ⅞". Make stretchers ½" longer than the pattern at each end. You need four board feet per chair.

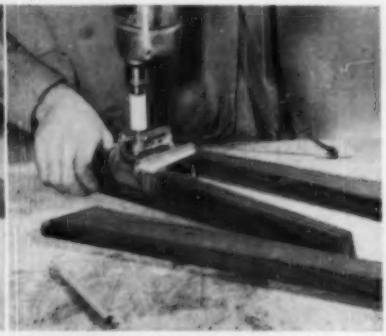


2 BANDSAW LEGS carefully to shape, notching back legs to take the seat. Blanks for the stretchers are sawed straight on all sides at this time. The angles and curves come later.

3 FIRST CUT FOR SEAT NOTCH in front legs is taken on saw table with miter gauge at 80° right of 90° for left leg, and left of 90° for right. Measure in ¾" and cut ⅜" deep.

7 SPOKESHAVE cleans up curves on the legs and stretchers after the tops and bottoms of the stretchers have been carefully bandsawed to the contours shown in the plan.

8 START ASSEMBLY by laying out parts for dowel-hole locations. You'll need guide lines only on the face if you use a doweling jig (foreground) to center holes in the thickness.



9 WITH BIT STOPPED to control depth, holes are drilled for ⅜" spiral wood dowels. Some doweling jigs have a depth-gauge attachment. Here a wood stop is used on the bit.

you'll discover another of Buchner's slick schemes for making topnotch construction easier. Usually a side-chair seat is a light plank supported on frame pieces. For the PSM chair, Buchner eliminated the separate framing and made the seat of sturdy ¾" plywood. It not only holds you but helps hold the chair together as well.

The leg stretchers are thick at the ends, giving the secure appearance of a doweled joint. They are doweled, either blind or clear through the legs. The centers of the stretchers do not need thickness for strength and so they are thinned, adding to the piece's look of lean gracefulness.

The front stretcher requires compound-angles on its ends. You can cut one end with the saw tilted to 5½° and the miter gauge at 88½°. The other end is cut in either of two ways. If your miter-gauge extension is as long as 16" or more on the other side of the blade, just flop the work over and saw from that side. Otherwise, you can reset the miter gauge to the other side of 90° and turn the work end for end while keeping the same face up.

The wood you use—each chair requires about six dollars' worth of solid stock and plywood—determines the final effect. Walnut, maple, birch, oak, ash, mahogany, chestnut or hickory are all suitable.

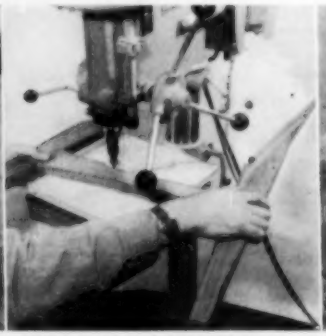
When you have finished the last stroke of hand rubbing, you will have furniture to show off—and live with.

4 TO MAKE SECOND CUT you need a special jig. Hold left leg upright in forward position. Right leg goes between rear cleats. Cut is ¾″ deep and ⅜″ in from inside face.

5 SIDE STRETCHERS are cut with the miter gauge set at 75° for the forward end, and 81° for the back. Saw all of the front ends first; then reset the gauge for the other cuts.

6 FOR COMPOUND ANGLE of front stretcher, you tilt the saw arbor 5½° and set the miter gauge at 88½°. Flop the stock for a second cut from the other side of the blade.

10 SIDE ASSEMBLIES are glued up first as separate units. Give the parts a trial assembly before applying cabinetmaker's resin glue and clamping. This will assure well-fitting joints.



11 ROUND SHARP CORNERS on side units and front stretcher in drill press, using a pilot-tip rounding-over bit with ⅜″ radius and, as a safety measure, a shaperbit collet as well.

12 FRONT STRETCHER is glued in place next. Check alignment carefully when clamping glued joint. The screw eyes just below the seat notches are used to attach the upholstered seat.

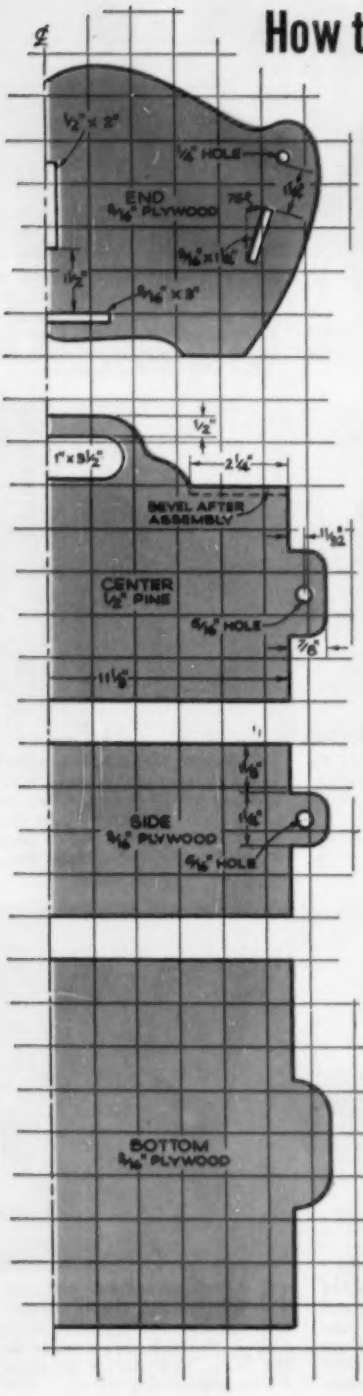
13 INSTALL BACK with screws driven through the back legs. Plug the screw holes or use oval-head cross-slot screws. Sand the assembly well and apply finish of your choice.

14 BANDSAW SEAT TO SHAPE from ¾″ plywood and cover with foam rubber or rubber-covered hair. Stretch upholstery fabric tightly over filler and tack or staple underneath.

15 AFTER COVERING BOTTOM with muslin, seat is slipped into notches and fastened with screws through screw eyes in the legs. This makes removal for reupholstering easy. END

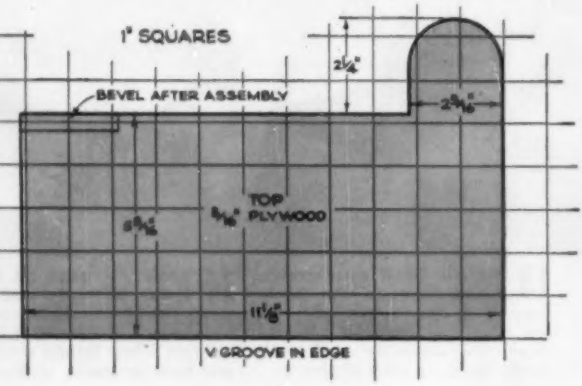
NEXT MONTH: How to build a dining table to match your chairs

How to build A Sewing Box

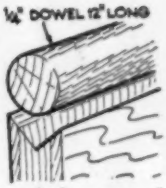


EVER think of building a practical gift that you could put in an envelope and mail? Here's one. Knocked down, this useful sewing box slips into an 11″ by 14″ envelope. The recipient can assemble it in minutes by springing a ¼″-by-11½″ dowel through holes in protruding tabs at each end.

Except for the center partition, which is best made of ½″ wood stock, the parts might all be cut from 3/16″ hardwood-veneer plywood. After transferring the patterns, cut the parts with a jigsaw or coping saw and sand them smooth. Fold coarse sandpaper over the corner of a small block of wood and rub it along the pivoting edge of each cover piece to cut a V groove. Glue a



You Can Mail

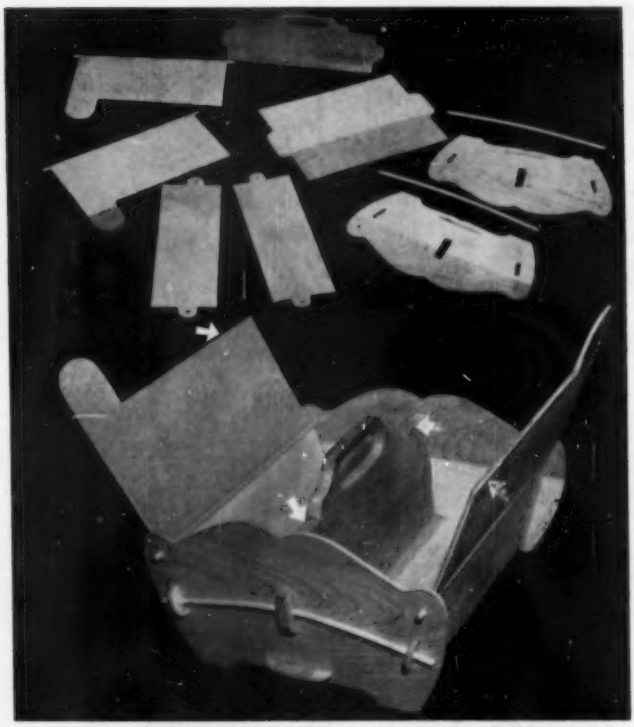


12" length of ¼" dowel into each groove, leaving 7/16" projecting at each end for pivoting.

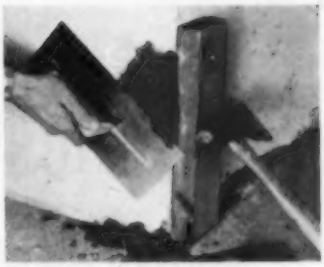
Assemble the dividers, sides and covers on one end first, and secure the tabs with a dowel. Then press the other end over the tabs and cover pivots, and thread the second dowel through holes in the tabs.

Bevel the top edge of the divider at each side of the handle to provide a flat surface for the cover tabs. Also bevel a part of the edge of each cover in line with the lifting tab on the opposite cover so both will lie flat when they are closed.

Finish with shellac or clear lacquer. Rub the final coat with steel wool, and apply wax.—*Kenneth Olin, Marquette, Mich.*



THE PARTS GO TOGETHER like an interlocking puzzle. The two dowels at right above lock the completed assembly, which has two spacious compartments. Arrows show the bevels that permit covers to close tightly.



Propped Block Forms Cement Corner

You can patch a damaged cement corner true and square by propping a block against one side to serve as a form. Wet the break thoroughly and fill it from the open side with a ready-mix patching cement. Trowel it flush with the wall and block edge, and leave the form in place until the mortar has become firmly set. —*A. L. Phelps, Azusa, Calif.*

Wire Hangers Strengthen Concrete

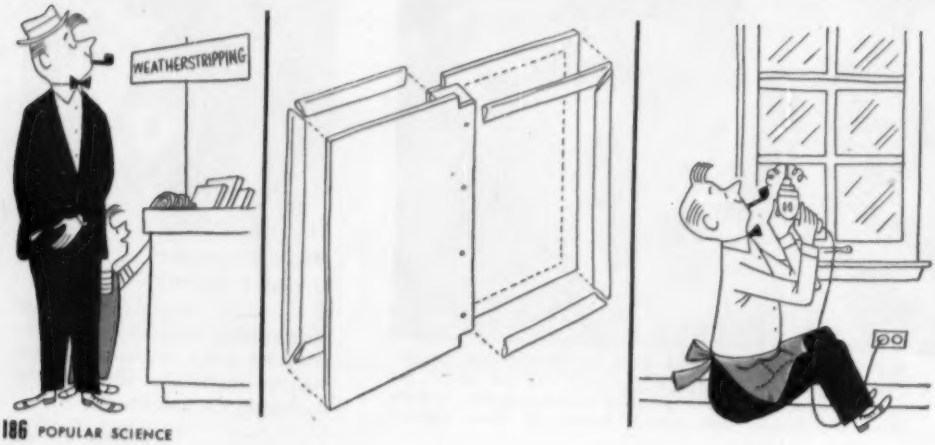
Wire coat hangers make fine reinforcing rods for small concrete jobs. When you pour regular shapes, just criss-cross them in the form. To reinforce odd shapes, like stepping stones, turn the hooks inward and bend the wires to the shape you want, then pour cement over them.—*Bill Copeland, Sarasota, Fla.*

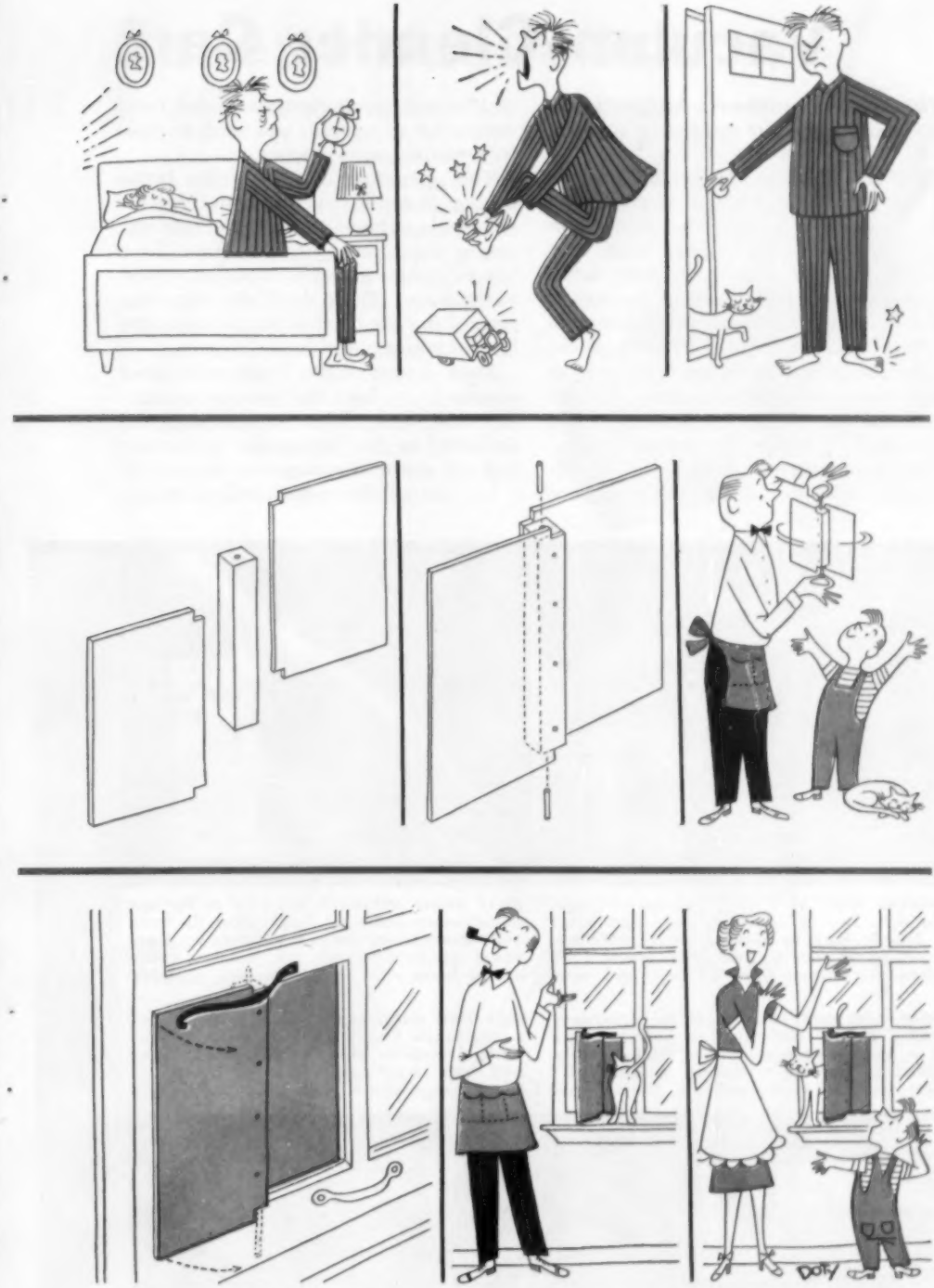
Pipe Cleaner Cleans Razor

Lost the cleaning brush for your electric razor? A pipe cleaner makes a fine substitute. It gets out the embedded dirt without damaging the cutters.

By Roy Doty

Wordless Workshop





Next Month: A doorstep shoe cleaner that scrapes and brushes

Vacuum-Cleaner Cart

This silent mother's helper rolls to work with all cleaning needs.

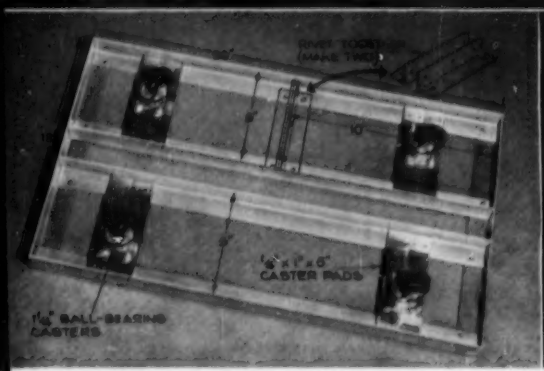
NOTHING is left behind when a housewife sets out with this cart to clean house. It has a place for everything—vacuum cleaner, hose, two extension tubes, six brushes, dust cloths, a sprayer and several bottled cleaners. It is made of the hardware store aluminum that you can cut with woodworking tools.

Two accessory boxes are bent up from light embossed sheet aluminum. Cut this to the pattern shown, but before bending to shape, fold over the exposed edges. You can make a jig for doing this by cutting a kerf ¼″ deep in the edge of a piece of 1″ wood. Insert the sheet metal, bend over as far as you can, and finish the fold by pounding with a mallet.

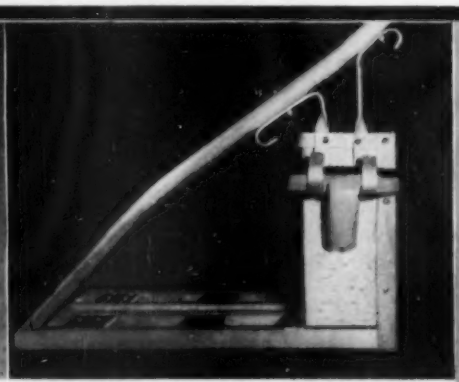
The open rear corners of the larger box are closed by riveting both edges inside angle strips fastened to the rear corners of the frame. Fasten the front of the box to a piece of angle riveted crosswise to the frame. The ⅛″-by-¾″ flat trim strip around the top of this box supports the handle brackets and brush hangers.

Floor a part of the frame with sheet aluminum to hold the vacuum cleaner. Pieces of thick rubber weather stripping cemented to the floor under the cleaner will cut down vibration and drumming.

Lay out a full-size pattern for the han-



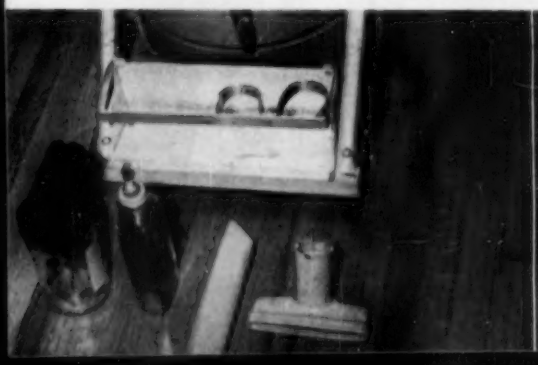
OVERLAP ENDS of 1″-by-1″ aluminum angle and drive two ⅛″ rivets in each joint. Rivet 5″ lengths back to back as center stiffeners. Attach caster pads 3″ from ends. Mount 1¼″ ball-bearing casters with ¼″ bolts and nuts.

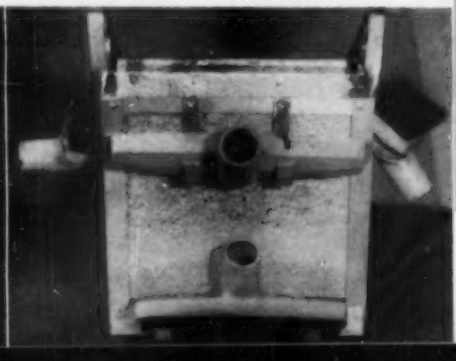


RIVET ANGLE UPRIGHTS 10″ long to the rear frame corners and a 12″ length across the frame 4½″ away. Mount the rear box between these. Shape brackets to suit the handles, rolling up the lower ends to hold brushes as shown.

FRONT ACCESSORY BOX holds the upholstery nozzle, crevice tool, sprayer and furniture oil or window-cleaning fluid. A retaining strip riveted to the upper corners is fitted with loops for the nozzle and the crevice tool.

BOLT TWO HANGERS to rear box rim to hold a long brush. The lower brush holder is angle stock, bolted to the vertical corner pieces, with two short upturned strips riveted on. Shape hangers to fit each brush individually.



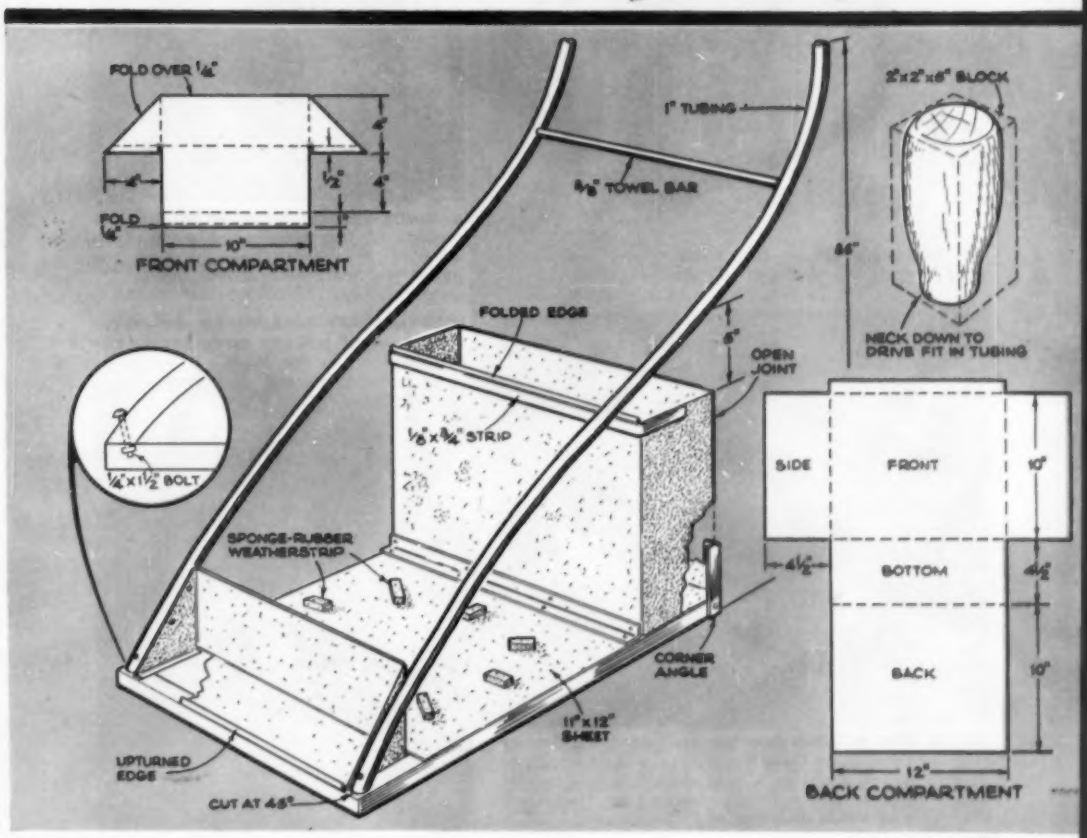


Eases Housework

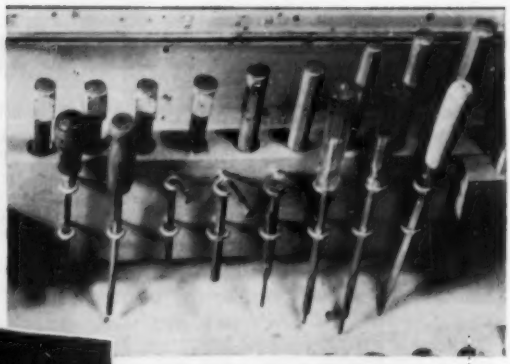
dles to help you shape both alike. Wood blocks bolted to a solid bench top make a bending jig. For best results, fill the tubing with sand and plug both ends.

To make the twist in the handle brackets, clamp ⅛″-by-¾″ aluminum strip in the vise 6″ from one end, grasp it with a monkey wrench 2″ above the vise jaws, and turn it 90°. Lock two square-head bolts close together in a vise, clamp the heads firmly together, and insert the stock between shanks for bending the scrolls.

Shape wooden hand grips with a rasp or on a power sander. Cut the towel bar overlength and spring it into ⅜″ holes drilled in the inner wall of each handle. *—L. H. Houck, Jefferson City, Mo.*

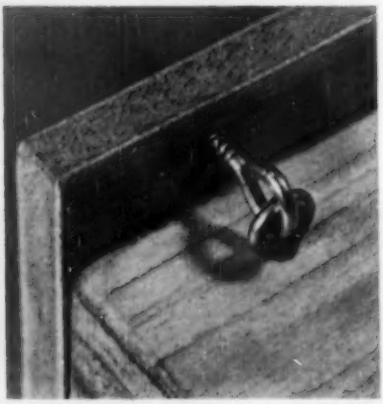


5 USEFUL TRICKS WITH Screw Eyes

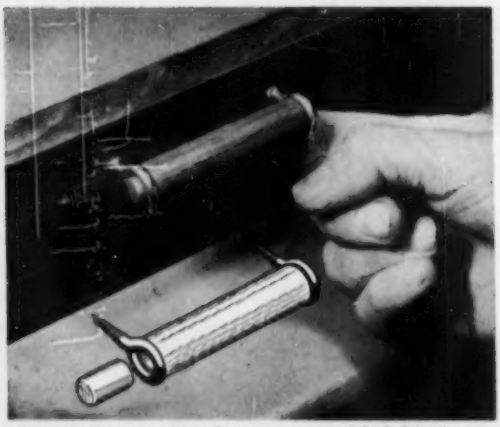


A RACK FOR SMALL TOOLS is made by arranging screw eyes in vertical pairs as you see at the right.

THE STRIKING FEET on this small cabinet are simply four large screw eyes turned into the bottom.

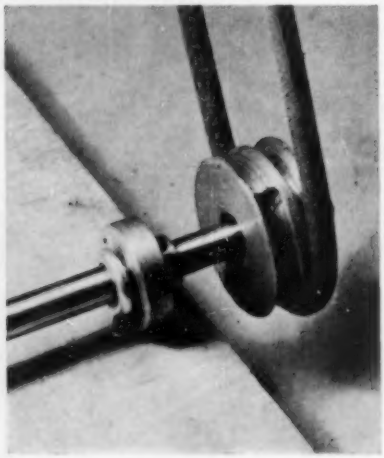


A HINGE suitable for light construction consists of two interlocked screw eyes, installed as shown above. Spread one screw eye apart to assemble hinge.



PEOPLE WILL WONDER how you assembled this drawer pull until you show them the secret—a short length of smaller dowel glued in a hole drilled in one handle end. The other end is turned down to fit. Use screw eyes with an inside diameter of 3/8".

NEED A SHAFT BEARING for an experimental setup? Select a screw eye to suit the diameter of the shaft.



How to Keep Doors Working

By Charles Adams

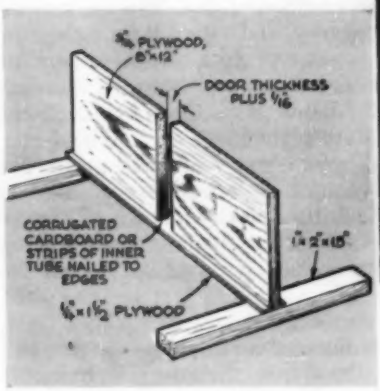
A DOOR that sticks, drags, binds or rattles is as common as a leaky faucet—and once you know what to look for, the solution is just as simple.

You can eliminate most troubles with a screwdriver, plane or a piece of cardboard. But be sure before you act.

A quick first look at a sticking door may suggest that it needs planing. But a second may show that the hinges are loose. A third may tell you that the hinges won't hold until you plug the screw holes first. And a fourth may show that you need a slight bevel on the back edge—the real cause of the trouble all along.

Silencing rattles. A door rattles only when it's loose at the latch and is free to flutter.

You can prevent this by resetting the stop strip on the latch side of the jamb. Move the top and bottom edges about 1/16″ *toward* the door, but keep the middle portion bowed about 1/16″ *away* from the door. When



A DOOR VISE to hold a door on edge for planing, mortising and other fitting is a useful addition to a home shop. When you rest the door in the slot, the thin strip at the bottom sags, pinching the door tightly between the two sidepieces.

TO CLEAR A CARPET, trim off the bottom of the door like this. Set a compass to the carpet thickness plus ⅛", then run the compass along the floor, marking a pencil line on the door (above left). Clamp a board across the bottom so you saw through both board and door at the same time (right). This helps guide the saw and prevents splintering any end grain.

A DOOR WON'T RATTLE if you set the stop strip so it touches the door at the top and bottom but is bowed 1/16" away from the door at the center. Slight bend in door against strip puts it under tension, holding latch bolt firmly. When painting a doorstop use a "dry brush" so that successive coats won't build up and cause the door to bind.

DOORS THAT SHRINK can be built back to shape by gluing and screwing thin strips to the edges. On the hinge side, avoid putting screws where hinges go. Sand strips flush, putty cracks, and repaint the area for an invisible fix.

the door is closed, it bends slightly against the bowed strip until the latch bolt falls in place; then it is held snugly under tension so that it can't rattle.

For a temporary fix, you can glue small pads of felt or cardboard to the top and bottom edges, which create the same effect as bowing the strip. But it's best to make the repair permanent.

Whenever you reset a stop strip, run a knife blade down along each edge to break the paint joint. This will make the strip easier to remove and keep it from tearing off surrounding paint.

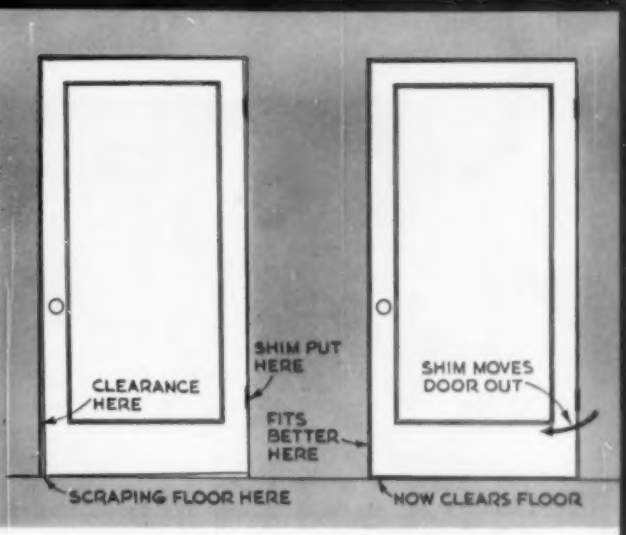
Pry the strip off gently with a thin, wide blade—a screwdriver will just chew up the soft wood. One trick is to insert a putty knife first, and then drive a small wedge under it. Nail the strip back on at new points, patching the old nail holes that have worked loose.

The cardboard test. You can quickly find out how well a door is fitting by running a piece of post card or other thin cardboard all around between the door and the jamb. Mark the spots that bind, for future planing.

But before you slash, first make sure that the hinges are tight—you can never put back the wood you take off. Loose hinges often cause binding and dragging by letting the door sag away from the jamb.

If the hinge screws won't hold tight, whittle tapered wood plugs and glue and drive them into the oversize holes. If

SHIMMING OUT HINGES helps set a door plumb, relieving sag or drag. You can slip small pieces of cardboard, felt or linoleum under a hinge without removing the door, as shown above.



previous plugs haven't held, it's best to bore out the old holes with a ⅜″ or ½″ bit as deeply as you have wood to drill into, then glue in hardwood dowels of the same diameter.

Drive screws in tight. A screwdriver bit in a brace will give you all the leverage you need to turn up the screws tight. Screws driven halfway in with a hammer first are a major cause of loose hinges and sagging doors. Dab a bit of paraffin or soap on the screws if the going gets tough, but don't do it if you don't have to—you want the screws to be as tight as you can get them.

While you're checking the hinges, also test their clearance with the cardboard. Any bind between the door and the jamb, or between the hinge leaves themselves, will spring the hinges and eventually loosen the screws.

A heavy door that is sagging may be pulled back in place by adding a third hinge in the middle. With the door closed, mark the top and bottom of the new hinge on both the door and the jamb, then take down the door and cut a mortise that matches the original ones.

The cardboard cure. A door that binds at the top or bottom can often be corrected by adding a cardboard shim under one of the hinges. Slipping a piece between the lower hinge and the mortise sets the door out a bit, having the effect of raising the lower edge. Shimming out the top hinge lowers the upper edge.

You can also shim out a door that has shrunk, leaving too big a crack between door and jamb. In this case, use cardboard or linoleum scraps depending upon the thickness needed, and place them under both hinges.

Call to surgery. A door that still binds after you've checked the hinges requires more drastic attention.

High spots on the door's edge can be planed or sanded off without removing the door. Jam it part way open with a rubber stop or with a piece of thin plywood blocked up on one side to form a spring wedge.

In humid weather, take off just enough to let the door close without scraping—it will shrink back a bit as the air dries. On doors that have stiles, bevel the corners with a rasp to 1/16″ more than you plan to take off, so that the plane won't splinter the end grain.

If you plane down the edge near the latch, you'll have to remove the lock, then set it farther in when you replace it. You can do this by enlarging the lock mortise with a rasp so that the lock can be pushed in toward the hinge side of the door (the escutcheon plate will conceal the oversize hole). Then remortise the edge so that the latch plate will lie flush with the newly planed surface.

If you have a lot to plane off (more than the escutcheon plate will safely cover), you can remove the door and take the excess off the hinge edge instead

of at the latch side. You then need only to deepen the hinge mortises (mark their locations first in case you plane them off entirely) and rehang the door.

Doors that won't close. When you have to heave your hip into a door to get it to latch, it means that the door is hitting the stop strip before the latch bolt reaches the opening in the strike plate. Some carpenters move the strike plate out, but it's easier to file the front edge of the latch opening so that the bolt drops in sooner.

Check first, though, to make sure that the stop strip is correctly located (it should bring the face of the door flush with the edge of the jamb). If it's set too far forward, it will keep the door from closing flush, and enlarging the latch hole may invite rattles if you later move the strip back. So set the stop first, then file if you have to.

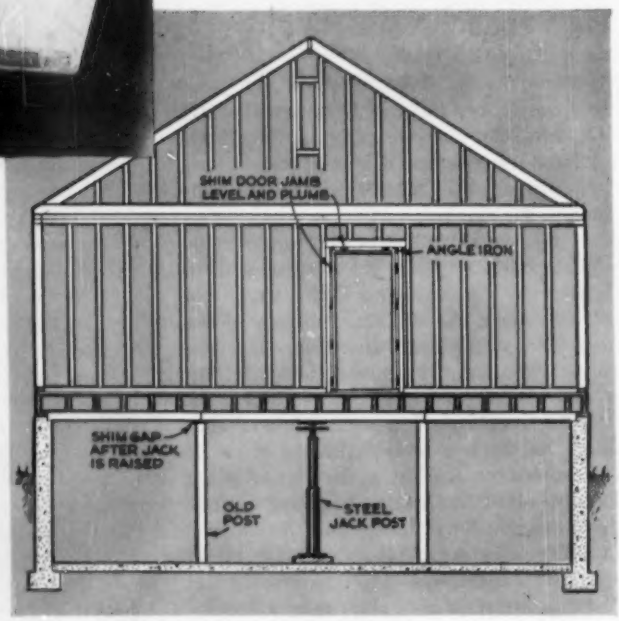
Filing is an even bigger help on sagging doors where the latch bolt has dropped below the latch hole. In this case, file the lower edge of the latch hole until the bolt falls in place.

A door that keeps popping open is binding against the jamb on the hinge side. Run a pencil line down the back of the door 1/16″ in from the hinge edge. Then plane a bevel along the edge to the depth of the pencil line, maintaining the angle as carefully as you can. This makes the door slightly narrower at the back, relieving the bind.

House settling. A door that can't be cured by minor refitting is probably the victim of a house that is settling, throwing the door out of alignment. It may act up so long as the house continues to settle (mostly during the first five years).

Fortunately, carpenters provide a simple built-in adjustment that permits you to realign your doors even while the house is settling around them. The door jamb is nailed to the wall frame through wood shims, never to the wall directly. By removing the jamb and adjusting the thickness of the shims, you can reset the jamb so that it is level and plumb. The door should then fit perfectly, even if the wall itself isn't level and plumb. END

DOORS THAT COME APART can be hammered back together, and then reinforced with metal mending plates. On good doors, mortise the plates into edges so they won't show; where looks don't matter, screw flat angles to the door face.



SEVERE SETTLING or sagging can be corrected by adding one or two inexpensive jack posts, available at hardware stores, to raise the floor. Place them under existing beams, and screw them up very gradually over several weeks to avoid sudden strain on wood and plaster. You can also strengthen door frames with metal corner braces.

Cotton Sacking Is Handy As a Drop Cloth

SEVERAL strips of cotton sacking a yard wide by three yards long come in handy for covering floors, furniture and walls on inside paint jobs. The inexpensive sacking gives as much protection as regular canvas drop cloths, and the strips can be spread or arranged more easily in narrow hallways and other quarters where space is limited.—*A. B. Kennerly, College Station, Texas.*

DO IT THE EASY WAY

TO INFLATE BALLOONS for a party, wedge the vacuum-cleaner hose into a kitchen funnel, slip the balloon over the neck, and operate the cleaner as a blower.

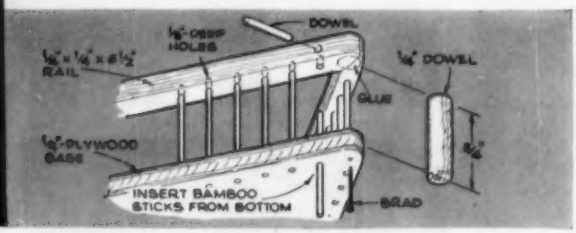
RUBBER TUBING slipped over both handles gives quick open-and-close action when you use a pair of pliers as a wrench.

DRY SOAP rubbed in the track helps you raise or lower a binding window.

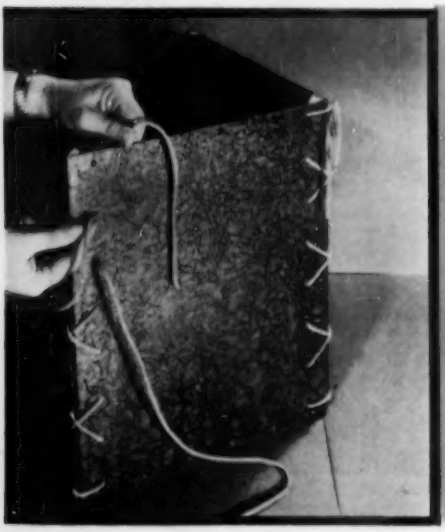
UNSTICK OLD DECALS with sticky cellophane tape. Press the tape down firmly and lift it and the decal off.

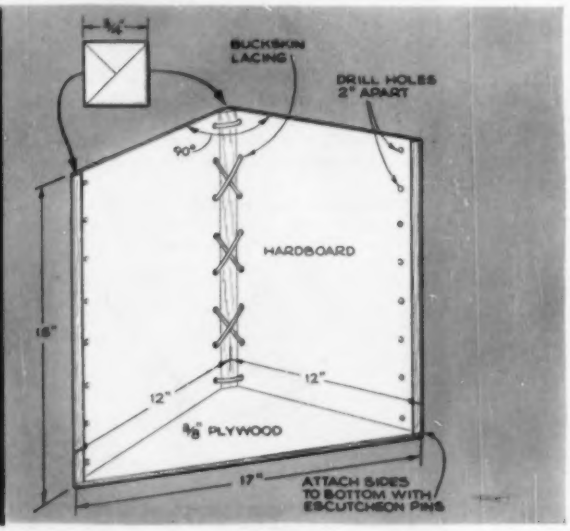
Four Accessories for the

1 This triangular nut tray has a hardwood-plywood base, round bamboo spindles, and hardwood top rails. After shaping the two 5½" equilateral triangles, one solid and the other of strips, clamp them together and invert them. Drill holes through the plywood and halfway through the rail strips. Glue and brad ¾" corner dowels between the triangles, then drive in the bamboo sticks. Finish the tray with stain and wax, or apply two coats of clear lacquer.

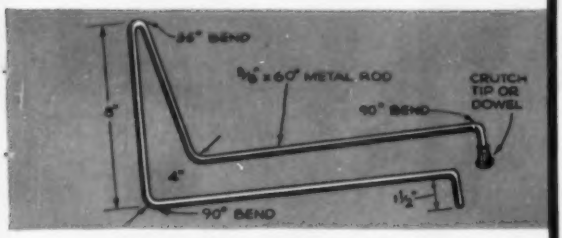


2 Tailored to fit in a corner, this wastebasket is just right for a small room. Cut the triangular bottom from plywood and the sides from plain or textured hardboard. Drill holes for the rawhide shoelaces that bind the sides together, and for the escutcheon pins that fasten the sides to the bottom. Glue and nail the sides to the bottom. Run off triangular, corner-reinforcing strips from ¾" stock, as shown in the detail drawing. Then tie the corners temporarily with cord and glue in the strips. Finally, thread in the rawhide, shoe style, crisscrossing the laces and then knotting the ends securely.





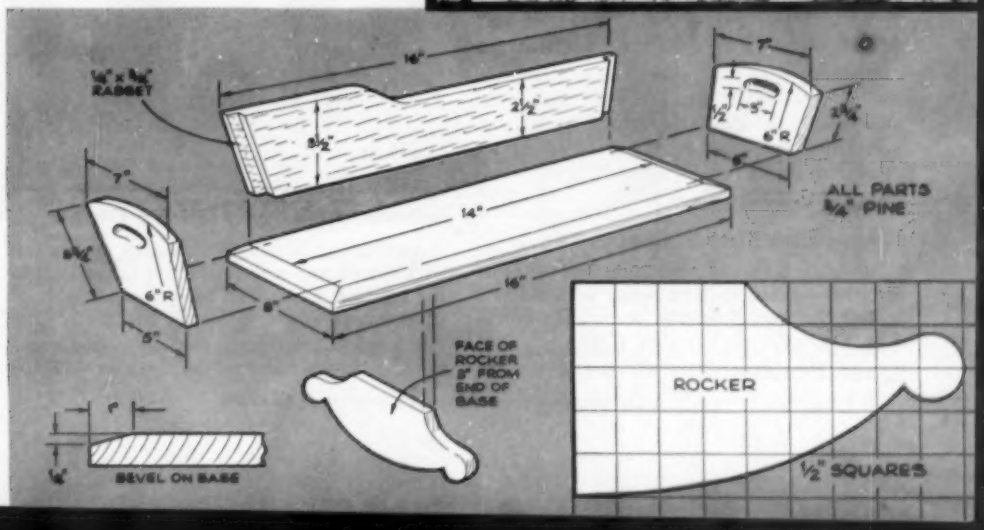
Living Room



3 **Smart book irons** like these can be made of ⅜″ brass, aluminum or steel rod. Bend a 35° angle at the center of a 5′ rod, and make two 90° bends on each leg of the resulting "U" to form the L-shaped book cradle and the legs. Polish brass or aluminum with fine steel wool, and brush on a protective coat of clear lacquer. If you use steel, apply flat-black enamel. Crutch tips, or ⅜″ dowels drilled out to make cups, form the feet.

4 **A copy of this antique** Colonial doll cradle makes a novel container for gourds or fruit. All parts can be cut from ¾″ clear-pine stock. Bevel the edges of the cradle floor and the bottom edges of the slanting sides and ends. Cut rabbets in the ends of the sidepieces so that they will lap the endpieces.

Assemble the miniature-cradle parts with glue and brads, taking care to nail on the rockers before adding the sides. Hand-rub the cradle with wax for an attractive natural-wood finish.



Meat Cans Size Hardware For Easy Picking

A DRAWER full of discarded luncheon meat cans will hold most of the small hardware you need around the workshop. My drawer (top view, left) holds 45 of these cans.—*Ken Hadenfeldt, Storm Lake, Iowa.*

Tank Takes Chill Out of Icy Water

COLD water is icy in our neighborhood, so I installed a 30-gallon, galvanized tempering tank to take off some of the chill before it goes into the water heater. A removable pan fitted beneath the tank stand catches condensed moisture. We now use less fuel since heating the water takes less time—*W. H. Schroeder, Milwaukee.*

Mark Warns It's Time to Change

COAT one end of your lighter flint with red nail polish. When the color shows up underneath the cigarette-lighter wheel, you will know that the time has come to replace the flint.—*Ken Murray, Colon, Mich.*

Linoleum Keeps Doors Clean

LINOLEUM scraps cut square, round or oval (as above) make attractive finger guards for cabinet doors. The easy-to-clean surface of the linoleum will match the floors and will keep finger smudges off the woodwork.

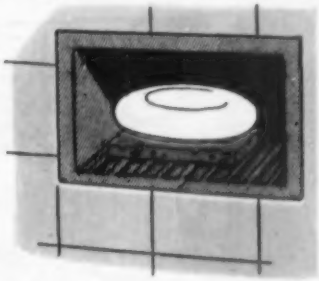
Aluminum Foil Protects Work

SEVERAL layers of aluminum foil wrapped or taped around an area being soldered will protect the work from the heat of the iron.—*Roy H. Copperud, Stockton, Calif.*

KEEPING THE Home SHIPSHAPE

A HAMPER IN THE ROOM will encourage small fry to be tidy. A new cover on the frame of a discarded garment bag makes a hanging closet hamper. A zipper at the bottom makes it easier to empty.

IRKED BY SOGGY SOAP? Slice through a cellulose sponge and make a thin pad to fit the soap well. Rinse it out now and then to keep it from sudsing up.



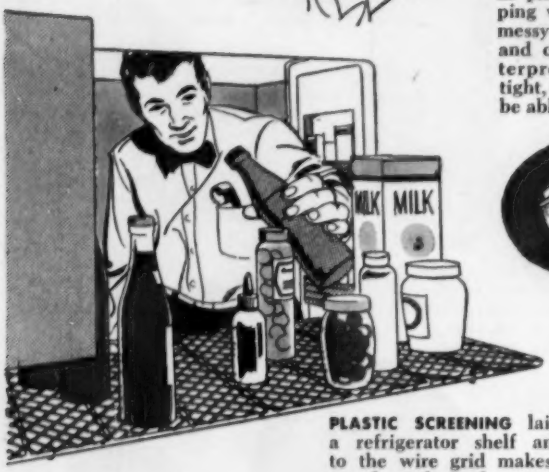
A LAMPSHADE FRAME makes a revolving holder for cooking utensils. Screw the frame under a shelf, placing washers on both sides of the hole for bearings.

A SLIPPERY BOTTLE of hair tonic, shampoo or shaving lotion won't slide through wet fingers if a rubber band is snapped around the smooth glass just where you grip the bottle with your hand.

Please turn the page for more home tips

More Home Tips

DELIVERY WINDOW in a back door makes it possible for you to take in packages without admitting wintry blasts. To install one, remove one or more panes and hinge a framed glass panel in the opening. A cupboard latch will hold the window shut.



WRAP YOUR WATCH in plastic food wrapping when you tackle messy jobs. The works and case will be waterproof and dust-tight, but you will still be able to tell the time.

PLASTIC SCREENING laid over a refrigerator shelf and tied to the wire grid makes a tip-proof surface for small jars and bottles. The holes allow plenty of air circulation.

SPLASHPROOF FLOWERPOTS are made by spreading a layer of marbles on top of the earth. They'll let water in but keep the wet soil from spattering around.

CUT CORNERS from envelopes to make small funnels for filling salt and pepper shakers. If cut as shown, so that the arms can be bent down, you'll have a self-seating funnel that will hold itself open.

FOOD-CLOGGED STRAINERS come clean in a jiffy when you scrub them with a vegetable brush. The stiff bristles work through the mesh so that it can be easily flushed clean under the tap.

How to Repair an Electric Oven

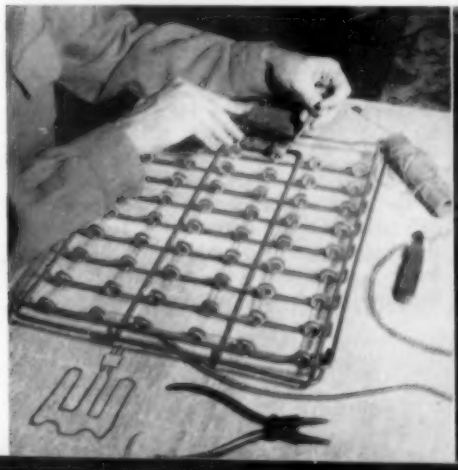
BURNED-OUT coils for electric ranges or other resistance-type heaters cost little to replace if *you* put in the new ones. You can buy the coils for a dollar or so, and by knowing the tricks you can do a fast, neat job.

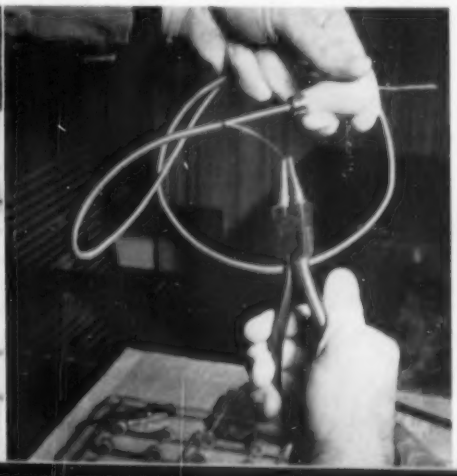
Most oven and broiler elements unplug from the rear and pull out like sliding racks. Elements in heaters and other equipment can be removed by loosening the mounting screws.

To find out how much new coil to buy, either take the unit to your dealer or give him the wattage, marked on the unit, and the diameter of the coil. He'll cut you off the correct amount of wire. You can then stretch it out to fit your particular unit, as shown in the photos.—*Darrell Huff, Sonoma, Calif.*

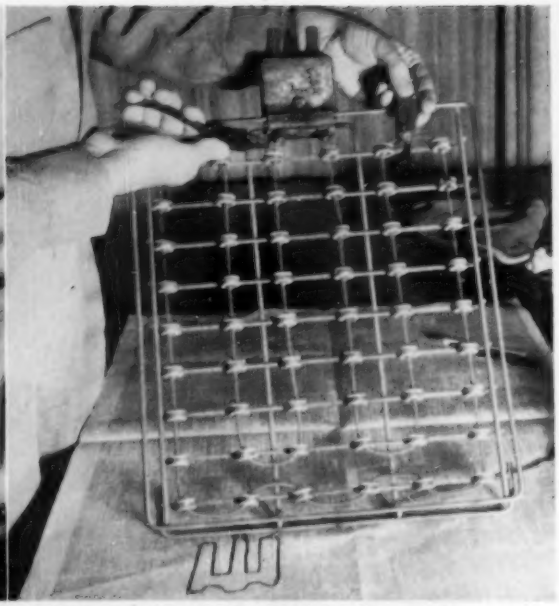
1 TO FIND LENGTH OF COIL that you need, string cord through insulators after removing old coil. Make a sketch (lower left) so you won't forget the winding path that the wire takes.

2 STRAIGHTEN OUT a couple of inches at each end of new coil for fastening to binding posts. To keep coil from kinking, insert an awl or ice pick and unwind it. *(Please turn the page.)*





3 CLAMP COIL IN VISE and pre-stretch to match length of cord you used for measuring. If you thread coil without pre-stretching, it will stretch unevenly, causing uneven heating.



4 NEW COIL IS STRUNG through insulators, following sketch plan. Bend loops in ends of wire and screw to terminals. (Replace cracked or charred insulators before stringing coil.)

Cartons Form Left-Over Concrete into Stepping Stones

When you do a concrete job, you may end up with some left-over mix. To keep it from going to waste—and to solve your disposal problem—round up some cardboard cartons. Pour about 2″ of mix into each and trowel the top. When the concrete sets, peel off the cartons. You'll have a supply of mixed-size stepping stones that will store compactly until you have enough to lay a walk.—*Warren Bohlman, Chicago.*

Coffee Can Marks Fuel-Oil Inlet and Keeps It from Freezing

Oil inlets that stick up in the lawn get no protection from water, mud and falling leaves. Cold weather may freeze the plug, and in any season grit settling in the recess at the edge of the cap can get into the oil line when the cap is removed. To eliminate these nuisances—and make a half-hidden inlet less of a toe-catcher—cover it with a coffee can.—*Frank A. Javor, North Bergen, N.J.*

You can take anything apart, but

Can You Put It Together Again?

By
Henry B. Comstock

THE other night, a friend of mine invited me to see some stereo slides. Thrown on a five-foot screen, the first one looked like an aerial view of the battleship *Missouri*, with her topside blown away.

"Wife's electric steam iron," my friend explained. "My boy started to take it apart a week ago, to find a short. I stopped him. Made him shoot this picture with the housing off. That boy is going to learn to put things back together right."

Of course my friend was carrying it to extremes. But he had a right to. During World War II his job was laying out gun-sight assembly-line procedures for Rosie-the-Riveter's kid sisters.

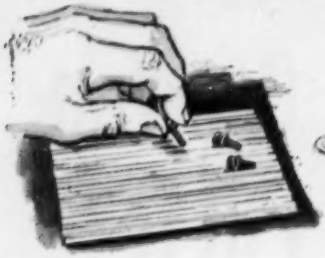
With exploded drawings, simple coding and an orderly work pattern, he taught youngsters who couldn't wire an electric light socket to handle precision jobs that would stump a watchmaker.

"Unless a machine or appliance is deliberately designed so that it can't be tampered with," he says, "the easiest part of the repair job should be the reassembly."

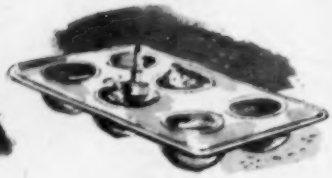
It makes sense, the way he tells it. Today most manufacturers are pulling for the customer who does his own repair work. They've stopped thinking of him as an all-thumbs jerk. If they don't toss a repair and replacement-parts manual in the carton with their product, you can generally get one by asking—for the price of a three-cent stamp.

Even with a manual at your fingertips, first study the assembly carefully before you take screwdriver and wrench in hand. Then follow through with the reassembly kinks that this expert passed along to me. You'll find them described on the next three pages.

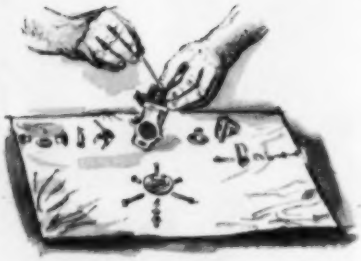
3 ways to keep track of small parts



MACHINE SCREWS, washers, nuts and other small parts won't roll off your worktable if you lay them on a sheet of corrugated cardboard.

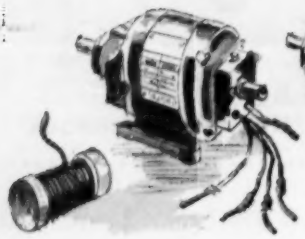


MUFFIN PANS or egg cartons make good sorting trays. Fishing the right parts out of their rounded, cup-shaped receptacles is quick and easy.

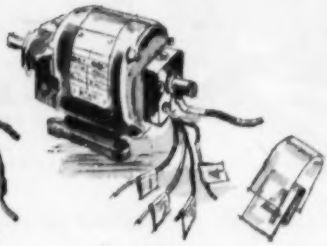


THERE'S NO HIDE-AND-SEEK when you use this jewelers' trick. Lay out parts on a strip of felt—schematically, if you like—and they'll stay in place.

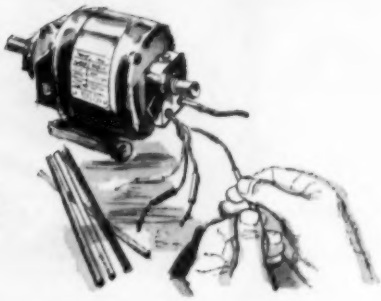
These simple kinks identify motor leads



FOR GREASEPROOF CODING, twist a different number of turns of stiff wire around each lead. Tape a code chart on the motor frame for identification.



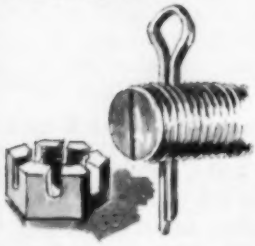
USE CELLULOSE TAPE for temporary marking. Wrap the tape around the leads and sandwich numbered tabs of paper between the ends of the tape.



OLD PROS USE THIS ONE. Slip sleeves of different-colored "spaghetti" tubing over leads. Bending the wire ends keeps the sleeves from coming off.

Scribe and punch marks make realigning easy

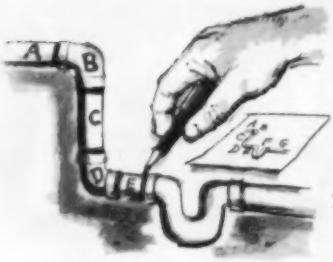
BEFORE PARTING two sections of a housing, scratch across adjacent faces with a file. Then realign the file marks for a perfect reassembly job.



WHY PROBE for a cotter-pin hole when a light file mark across the end of the bolt will allow you to check the cotter pin's alignment at a glance?

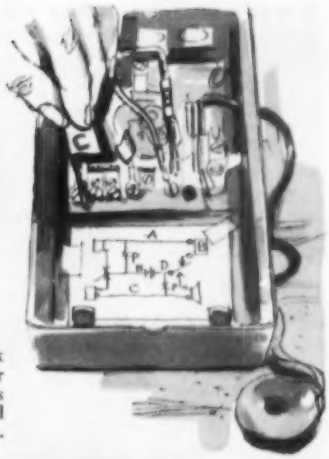
USE PUNCH PRICKS for neat, permanent marking, but not on cast or brittle metals that might break. Dots, here, show how the timing gears should mesh.

Grease-pencil indexing is fast



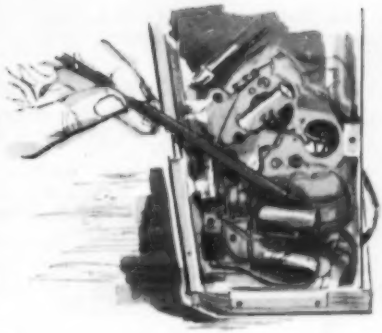
PIPE CONNECTIONS may be too long or short when you reassemble them if you don't mark the depth of threaded joints. Index parts in proper order.

FOR QUICK REPLACEMENT, mark the position of tubes in their sockets. Adhesive tape on glass or wires (right) makes a good surface to make guide mark on.



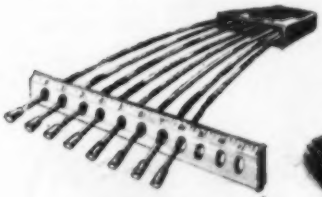
2 color-coding tips

NAIL-POLISH BOTTLES are handy for holding different-colored enamels used to code wires.

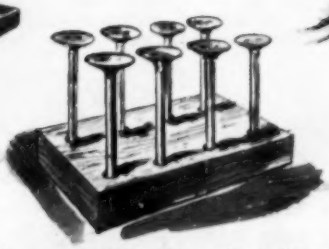


CIRCUITS ARE COLOR-CODED for identification. Use the same colors when replacing wires.

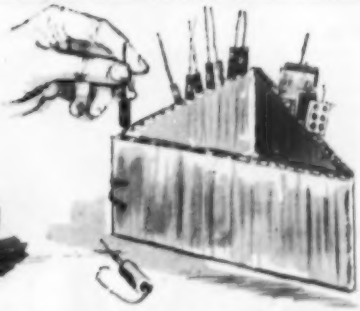
Hole-sorting identifies parts



ONE-FOOT RULE, with a hole drilled under each inch mark, keeps disconnected spark-plug or other complicated wires in proper order for replacement.

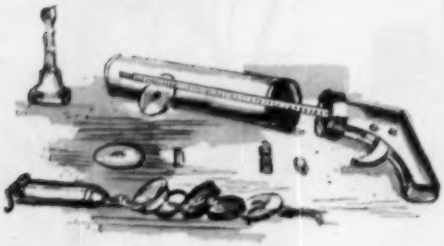


REMEMBER this valve-indexing trick? Wood block drilled part way through has many other uses, including a heads-up holder for gear-train parts.

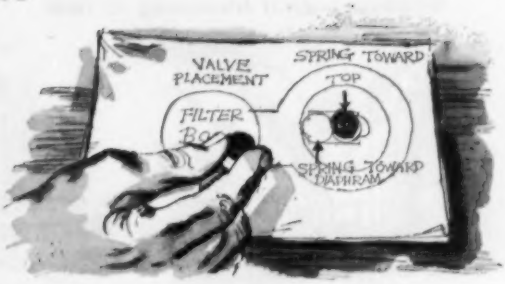


TRIANGLE of corrugated cardboard, with the ends wired together, makes a handy stand for holding radio components inserted in the right order.

5 ways to remember what goes where



THREAD A STRING through a train of parts, such as the washers, disks and plungers of this calking gun. Knot the string at the ends.



LAY PARTS at their correct locations on a full-size diagram of an assembly. Make the diagram when you first take the mechanism apart.

YOU CAN ADAPT this orderly, in-line layout of lens-mount parts to many assembly jobs.

FOR COMPLEX PROJECTS, arrange parts schematically, like those of steam iron at right.

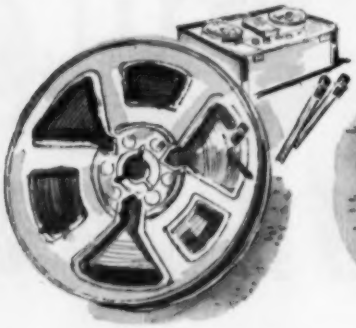
HERE'S A VARIATION of string sorting. Place parts in sequence on a threaded shaft.

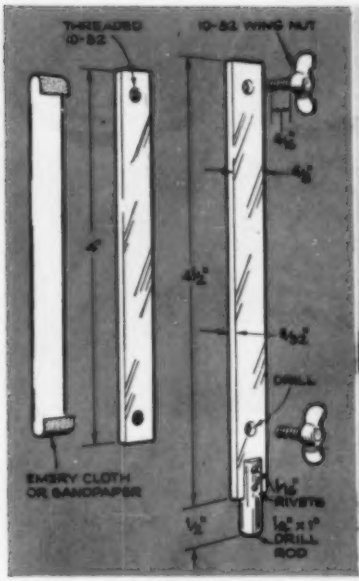
Use these reference marks for repeat performances

CLIP OFF the upper right-hand corners of slide mounts inverted for projection and you'll always know how to feed the slides into the machine.

TO MARK A REEL of recording tape where Junior starts his "Flight of the Bumble Bee," lay a paper match on the tape and then rewind the reel.

A WAX-CRAYON MARK on a long-play record will let you find your favorite selection any time you want it, and without harming the recording.





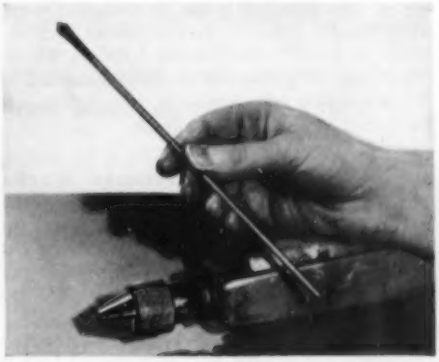
Jigsaw Sander Smooths Straight, Inside Wood Surfaces

STRIPS of sandpaper clamped to the face of this sanding plate (left) will make short work of sanding inside edges.

Hacksaw a slot ½" deep in one end of a 1" piece of ¼" drill rod, and rivet a 4½" strip of 3/32"-by-⅝" flat steel to it. Drill clearance holes for two 10-32 wing bolts. Cut a 4" length of 3/32"-by-⅝" steel for the sanding plate, and tap two 10-32 holes for the wing bolts. Fold the ends of a ⅝"-wide strip of sandpaper over the sanding plate and clamp it by tightening the wing bolts. Chuck the shank in the jigsaw with its center insert removed, and run it at medium speed to keep from burning the stock you're working on.—*Dick Hutchinson, San Gabriel, Calif.*

Bottle Cap Saves Chisel Handle

A BOTTLE cap tacked or nailed to the top of your wood chisel will help keep the handle from mushrooming or splintering under the impact of repeated hammer blows.



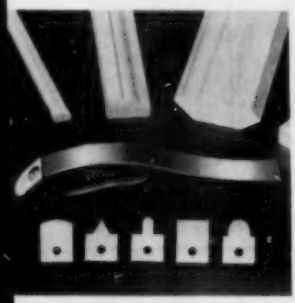
Heavy Wire Makes Long Drill

YOU can improvise a long drill from a piece of heavy steel wire or solid curtain rod. Flatten one end, file it to a spear point and bevel the back edges, away from direction of turn. Use the drill with light pressure. —*Frank A. Javor, North Bergen, N. J.*

New Tools

1. Jaws Lock on Wrench. The jaws on this wrench won't slip out of adjustment if you push up a locking plunger. It grips the adjustment sleeve, keeping it set while you start a bolt or nut on its way out. To release the jaws, just push the plunger down. The Superjustable comes in 6" to 12" sizes and is made of chrome alloy.

2. Drill Gets into Corners. Chuck and handle of this drill twist into snakelike shapes so you can drill in the narrowest places. With the handle at right angles to the chuck, the drill takes up half the space of a regular hand drill. The chuck rubbernecks in a 270° arc, handle 180°. A flip of the spring lock changes chuck positions. The All-Angle drill takes up to ¼" bits, which can be stored in the hollow handle.



3. Scraper Works on Curves, Odd Shapes. Six specially designed scraping blades skin the old finish off moldings, picture frames, windows, antiques and odd-shaped pieces. The Shape-Skrape blades, made of steel, screw onto a molded handle.

4. Tubing Bender Pre-Sets Angle. Set the dial (0° to 180°), bring down the lever, and your tube is bent to the desired shape. The bender forms hard or soft tubing: copper, steel, aluminum and thin-wall conduit. Each Blue Dot bender handles only a single size tubing, ⅛" to ½" O. D.

5. Small Grease Gun Lubes Big Jobs. Imitating big brother, this 4-oz. grease gun makes lubricating workshop or other equipment easier. Little Lube can be used for pressure greasing or ordinary jobs. A coupler and needle adapter are available.

Further information on the tools shown on this page can be obtained from: 1. J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N.Y.; 2. P & C Hand Forged Tool Co., P. O. Box 5926, Portland 22, Ore.; 3. Adams Products Co., 119 Ann St., Hartford 3, Conn.; 4. The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7; 5. Universal Lubricating Systems, Inc., 747 Allegheny Ave., Oakmont, Pa.

What Steel Is That?

All of it looks pretty much alike, but there are simple tests that will help you pick out the type best suited to the job.

By John Burroughs

WHEN the man in the machine shop said I could help myself, I fished the piece of steel out of the scrap barrel. It was a bar about ⅜″ thick, 1¼″ wide and 10″ long—just the right size for the blade of the sheath knife I wanted to make. I put it in my pocket and went home happier than a pack-rat with a new penny.

But then I began to wonder what kind of steel it was. Suppose I heat-treated it, fitted grips and worked down the cutting edge—only to find that I had wasted all my work on the wrong stock.

That evening I chased over to ask Dutch Morgan whether the bar would make a civilized knife. I found him in his basement, inching the flame of his blowtorch along an old clock mainspring.

"Making a cookie cutter," our best tool-and-die man admitted sheepishly. "Betty's invited the girls in her club to a get-together, and she thought it would be ducky to serve cookies shaped like the club emblem. I'm softening up this spring so I can bend it to outline. Then I'll solder it to a backing plate."

I showed Dutch my piece of steel. "Is

FILE TEST. Mild steel files easily, tempered tool steel is fairly hard to file, and hardened, high-carbon steel can't be filed. Between the first two types are medium carbon steel and annealed (softened) tool steel. The difference in the two cannot be detected by the file test.

HARDABILITY TEST. To find out whether fairly easily filed stock is medium carbon steel or annealed, high-carbon tool steel, heat a sample until it glows bright red, and then plunge it into a can of oil. If it comes out file-hard, you've got yourself a chunk of tool steel.

this the stuff they use for cutlery?"

Dutch ran his thumb along one edge of the bar. "Ground stock," he said. "It's probably a piece of electric-furnace tool steel. Run-of-the-mill machine steel wouldn't have a ground finish."

What the sparks can tell. Loosening a screw, he removed the guard from his grinder and switched on the motor. Touching the stock to the top of the wheel, he studied the shower of sparks that streamed out horizontally.

"That's what I thought," he nodded. "It's a low-alloy chrome-vanadium tool steel. About point/90 or 1-point 10 carbon. Yeah, it'll make you a good knife."

I was impressed. "You mean you can tell all that from the sparks?"

"It doesn't give you a complete analysis," he admitted. "But it's a quick way to tell one steel from another. Here, try it. As a start, look for sparks that break up in bursts. The more bursts, the more carbon content."

I did as he suggested, taking experimental grinds at the tool steel, a nail, the end of a file, and the blade of my pocket knife. "The fireworks sure are different," I admitted.

The hardening test. "Want to whack a half inch off your ground stock and try hardening it in oil?" Dutch asked me.

While I went at the bar with a hacksaw, Dutch brought a can of oil from his garage, and pumped up the blowtorch. Propping the bit of metal I'd cut off on a firebrick, we heated it red-hot. With his pliers, Dutch snatched it up and dunked it in the oil. When it had cooled he wiped it off and tossed it to me.

"Try scratching that bottle on the bench," he said. Sure enough, the steel scratched the glass.

"It works," I admitted, "but I don't see why. How come only high-carbon steels harden? Where does the carbon get in the act?"

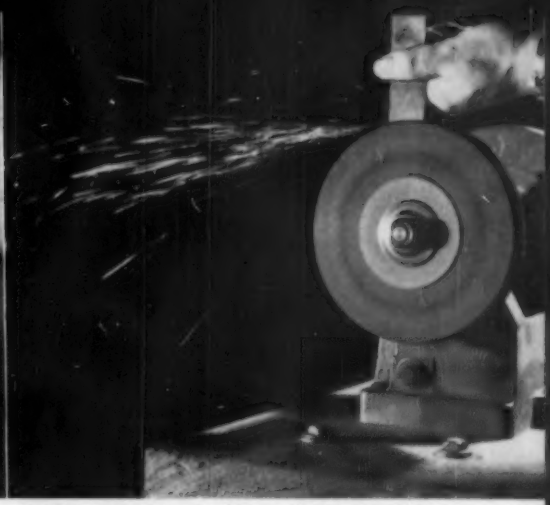
"***It forms hard carbides*** when you quench the stock. Any steel with more than 70 points of carbon will turn file-hard."

"Points?"

"That's just a convenient way to express the carbon content. A point is one-hundredth of one percent. The whole deal is a little like making fudge. How a batch of steel turns out depends on what you throw in the pot, how you cook it and how you cool it. It's either soft and gooey—tough, you'd say—or it's hard and brittle."

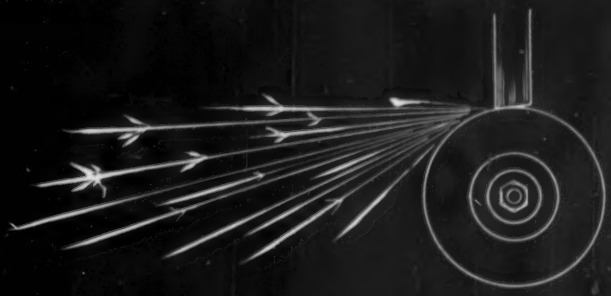
Now that I came to think of it, I didn't

SCRATCH TEST. Draw a corner of the hardened sample across a piece of glass. Fully hardened, high-carbon steel will leave scratches in the surface. This kind must be worked while annealed, then hardened and, finally, re-heated at about 400° to relieve internal strains.

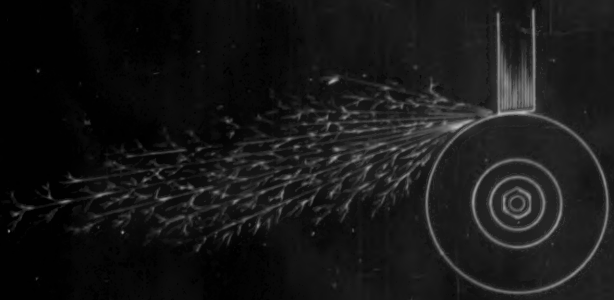


SPARK TEST. Touch the stock to a grinding wheel and study the shower of sparks in subdued light. Their pattern will tell you the approximate carbon content, whether the steel is alloyed, and with what. Typical spark patterns are shown in the drawings below.

MILD STEEL throws off strong, light-yellow lines ending in brilliant, white, orange-tipped tongues. Interspersed with the lines are a few simple carbon bursts.



HIGH-CARBON TOOL STEEL sparkles with fine, feathery bursts. The more plentiful and complex the bursts, the higher the carbon content. Neither hardening nor annealing changes the pattern.



LOW-ALLOY STEEL is identified by disjointed orange lines, with some carbon bursts which the alloying metals tend to suppress. Forked tongues at the end of the spark stream identify nickel; long dark-yellow lines, chrome; very bright sparks with increased spray around the wheel, manganese; and red-brown lines with bright-orange tongues, tungsten.

Typical jobs for various steels

HOT-ROLLED MILD STEEL is too low in carbon content to harden when heated. Tough, it can be twisted or bent; welds easily. Use it for assemblies like this decorative stair rail.

know anything about iron or steel making. So I pumped Dutch on that, too.

"It's like this," he explained. "First you fire up some iron ore, coke and limestone, and pretty soon molten iron runs out at the bottom. If you pour it into molds, it becomes cast iron.

"Back there at the blast furnace," Dutch went on, "your hot iron picked up carbon from the coke. Dissolved it, like water dissolves sugar. There's about four percent carbon in cast iron, making it crystalline and brittle."

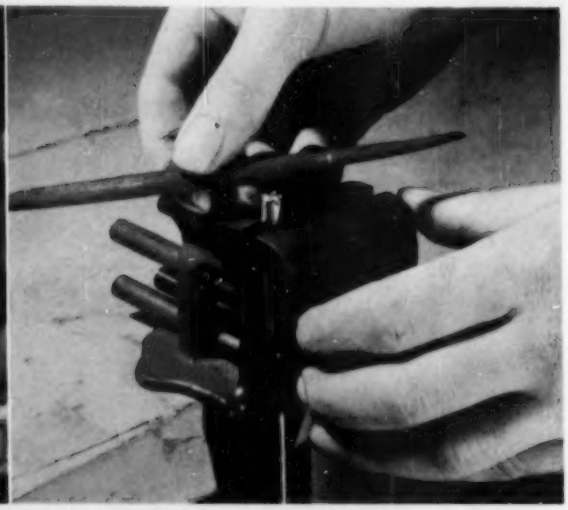
"What about steel?"

"I'm coming to that. Suppose you put your cast iron in another furnace and burn out the carbon. Throwing in some iron oxide does it, or you can speed the process by bubbling compressed oxygen up through the metal. The impurities in the iron combine chemically with the slag, and when you run out the batch it's relatively carbon-free iron. Just a trace left in it—about one-tenth of one percent. That's mild steel."

"How about tool steel?" I asked.

"Simply add some carbon to your mild steel. Melt it up again and toss in a little ground anthracite coal, maybe, or a small piece of cast iron. Say you want some

COLD-ROLLED MACHINE STEEL, which comes in bars, rods and plate, is good for shafting and structural parts. Rolling it cold toughens this low-carbon steel and gives it a smooth finish.



HIGH-CARBON STEEL can be worked with comparative ease when annealed. This is the stock you use for making special tools like this star-tipped punch, lathe-tool bits or knives.

steel for cold chisels; then you increase the carbon content to eight-tenths of one per cent—80-point steel, that is. Up the steel to 130 points and you can make razor blades of it. But you don't want to go much higher than that. If you do, your steel will be almost as brittle as cast iron again."

"While I'm making steel," I said, "why don't I stir in something to alloy it?"

"***Alloy steels*** are a little tougher than plain carbon steels, and they're easier to harden."

"How come?"

"Because you can give them a slower quench. Plain carbon steels have to be quenched in water or brine in a hurry, to cool them fast enough to form hard carbides. Drastic quenching sets up strains in the metal which can warp or crack it. But if you use a steel with a little chrome or nickel in it, you can harden the tool in warm oil."

"I've read about 'oil-hardening steel' somewhere," I said.

Dutch nodded. "That's a definition for low-alloy steels, just as plain carbon steel is sometimes called water-hardening steel. Then there's another group of steels containing about four percent chrome called air-hardening steel. Just letting them cool in air hardens them."

"Stainless steel is a chrome alloy, too, isn't it?"

"It's a high-alloy steel," Dutch said, "with anywhere from 11 to 27 percent chrome. Good enough for kitchen knives, though a butcher wouldn't use one."

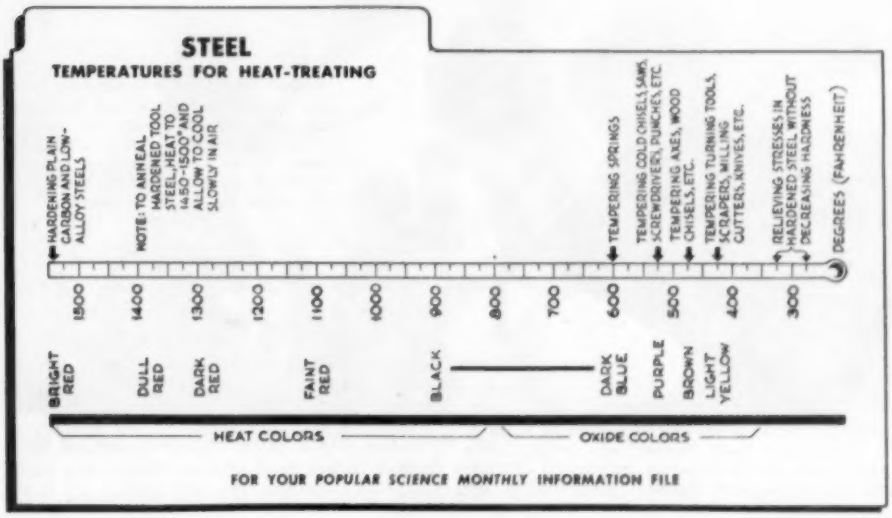
"Getting back to knives," I said, "you told me this ground stock of mine is low-alloy tool steel. Then I quench it in oil?"

Can be oven-tempered. "You're learning fast," Dutch grinned. "It'll probably quench out file-hard. Then temper it at about 400° to relieve strains in the metal. Safest way is to put it in your kitchen oven for a couple of hours. If you use a torch it may get too hot, and before you know it you've got a spring instead of a blade."

While we'd been talking, Dutch had finished shaping the spring for his cookie cutter. Setting it on the backing plate, he flowed solder around the joint with his torch and trued the cutting edge on his sanding disk. We went upstairs and his wife looked it over approvingly.

"Thanks, Hon," she said, "but what took you so long?"

My sheath knife? It turned out fine. As I always say, if you want a thing done right, first find out how to do it from somebody who's smarter than a treeful of owls. Then do it yourself. END



I Like the Gauges Detroit Left Out

An ammeter and oil gauge help you drive. It's easy to sub them for those new red blink-out indicators.

By Phil McCafferty

WHAT YOU'LL NEED to equip a new car with an oil gauge and ammeter is suggested at the left. The instruments can be mounted on an aluminum panel, marked and cut as outlined, painted and then mounted under the dash as above.

THE red lights that are appearing on the instrument panels of new cars to tell what is going on in the electrical and lubricating systems are great, I suppose, for those who don't know what a generator or oil pump is—and care even less.

But, from the day I drove my new car off the dealer's floor I didn't feel at ease. Sure, it's just like the book says. When the red lights go out,

the generator is working and you have oil pressure. But to me it's like driving in a soupy fog. You know the road is ahead. But just exactly *where* is it?

Suppose you have your lights, heater and radio on, drawing some 30 amperes from the battery. Suppose at the same time the generator is only producing 20 amps. The "GEN" light would be complacently off.

You would be in trouble. But you would not know a thing about it until the starter solenoid gave off a hollow click the next time that you tried to start the car.

My operator's manual says that the "OIL" light goes out when pressure reaches 14 pounds per square inch. That's fine. But I've always liked to know just how much oil pressure I have. I'd hate to drive faster than 20 m.p.h. to the nearest garage (with any of the new V-8 engines) with only 15 to 16 pounds of oil pressure. Falling oil pressure is a sure sign of trouble.

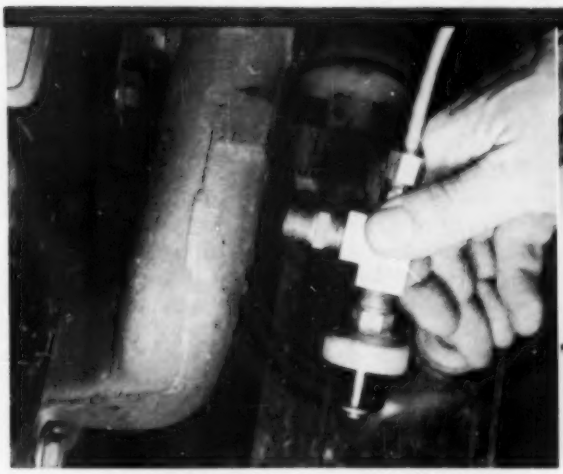
But, I now know a lot more about what is taking place under the hood of my car—and feel a lot more at ease. I bought an oil-pressure gauge and an ammeter and installed them myself. The whole outfit cost about $10. That was for new stuff. You can do the job for a lot less by getting your gauges from a junk yard.

As soon as I hooked up the ammeter I learned that my generator was overcharging most of the time. Rather than work over the voltage regulator myself, I took the car back to the dealer. He fixed it and told me what I knew—that it was a good thing I brought it in when I did or I'd have soon been buying a new armature—or complete generator.

Mounting the gauges. Some cars have room for the instruments on the dash. A circle cutter or hole saw mounted in a hand or electric drill works well for cutting the holes.

If you decide, as I did, to put the gauges under the dash, make a cardboard pattern for the mounting bracket. Bend and trim it to fit where you wish, then transfer the shape on 20-gauge (18 to 24 gauge will do fine) sheet metal or aluminum. Bend the bracket to shape after the holes are cut. Attach the bracket with sheet-metal screws.

A neat-looking paint job can be had by using touch-up paint, available from the dealer. I sanded the metal smooth and brushed on one coat of touch-up paint. When dry, I sanded the paint

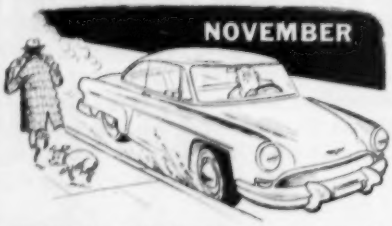


TEE FITTING enables you to use both oil indicator light and gauge. Check system for leaks with engine running. If an electric oil gauge is used, screw the sending unit into the tee.

A BULB SOCKET soldered on back of the metal panel lights the gauges that the writer installed. Connected in parallel with dash light, the lamp shines through slots in the gauges.

ALMANAC
FOR MOTORISTS

Pithy proverbs, provident counsel and omens and portents of interest to horseless-carriage operators.



▶▶**Curbs and tires** have an inherently hostile relationship, like cats and dogs. If you don't want to be let down, stay friendly with your tires whenever you park.

▶▶**Is the weather** growing nippy where you live? Don't forget to reset the accelerator-pump link on the side of the carburetor to its cold-weather position.

▶▶**On the subject of weather,** ice is fine for skating but a genuine nuisance in the bowl of a fuel pump. We don't mean to nag, but it won't take you three minutes to drain it.

▶▶**Brake wear,** a creepingly gradual affair, is sometimes masked by a driver's unconscious ability to adapt to failing brakes by tramping harder on the pedal. Next time you take the wheel, make a point of seeing just how good your stopping power is.

▶▶**When a seemingly healthy battery** turns up its toes, make sure that the heavy-current terminals are tight. Under the high starter drain, a poor connection may imitate a dying battery.

▶▶**Study the mirror-using habits** of a good driver and you'll discover why he never gets surprised from behind. The mirror receives a frequent, flicking glance, and there's always a quick check just before he changes lanes.

smooth with very fine sandpaper and applied a finish coat of paint. This coat was rubbed smooth with rubbing compound and waxed. It looks like part of the dash now.

Connecting the ammeter. For an honest picture of the condition of the electrical system, you'll want the ammeter to be hooked between the battery and all the equipment except the starter. The hot wire runs from a terminal on the starter solenoid to the light or ignition switch (in all the cases I know of).

Open this wire between its start and the first connection. Hook the ammeter in series with this line. Solder all connections. If the severed line is too short, splice in lengths of wire equal in size to the existing wire. If the ammeter shows "charge" instead of "discharge" when the headlights are turned on, reverse the ammeter leads. (I've stated it this way because it is probably the least confusing. Battery polarities are different in some makes of cars, and some ammeter connections are not marked "positive" and "negative" so you may have to experiment to find out which is which.)

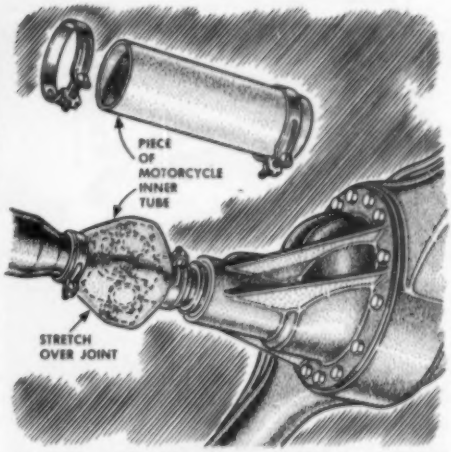
Hooking up the oil gauge. The little red bulb marked "OIL" on the dash is hooked between the ignition switch and a sending unit on the engine block. When the engine is not running the diaphragm in the sending unit is grounded, turning the light on. When oil under pressure forces the diaphragm out, it is no longer grounded, turning the light off.

Remove the sending unit from the block. I decided to leave my little red light hooked up, so I bought a brass tee, screwed it into the block and ran copper tubing from one side of the tee to the oil gauge. In the other side of the tee I screwed the indicator-light sending unit, hooked up in the normal way.

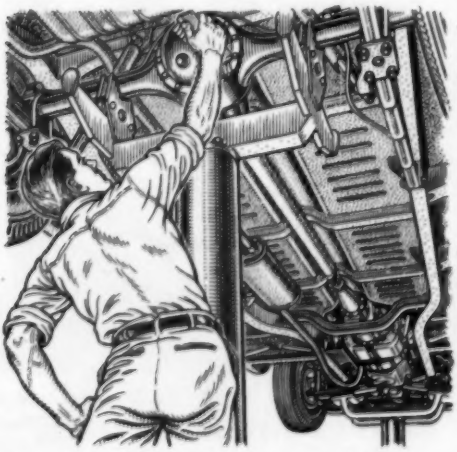
If you decide to use an electric oil gauge, screw the gauge sending unit into one side of the tee and the indicator sending unit into the other. If it is desired to have the gauge only, screw either the tubing or the gauge sending unit directly into the block where the indicator unit was attached. END

Hints FROM THE MODEL GARAGE

Clean headlights are as important as a clean windshield when driving at night. Even though yours may look clean, tests have proven that a single day's accumulation of dirt on headlight lenses can reduce their effectiveness by as much as half.



Universal joints will stay free of dirt and mud with these protective covers. Cut pieces about 10″ long from a small-size inner tube and have your garageman slip them on the next time you have the bearings packed. Close the tube ends with hose clamps.

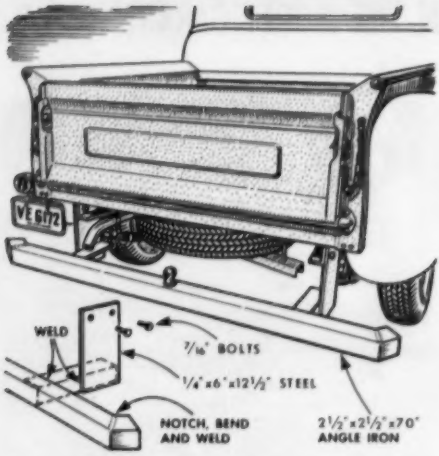


Running gear will run cooler if steam-cleaned or brushed with solvent once a year. A coating of grease and dirt on the rear axle, transmission and oil pan keeps the heat in, thinning out the lubricants and reducing their efficiency considerably.

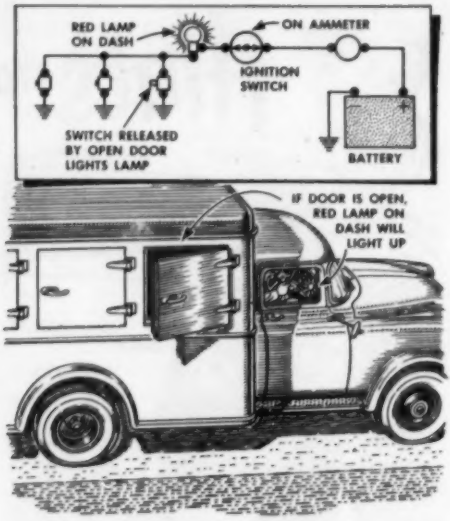
If the terminal marks on a battery are worn, attach two wires to it and hold their ends in a drop of battery acid, salt water or saliva. Move the wires close together and bubbles will form around the one that leads to the battery's negative terminal.

Please turn the page for more auto hints

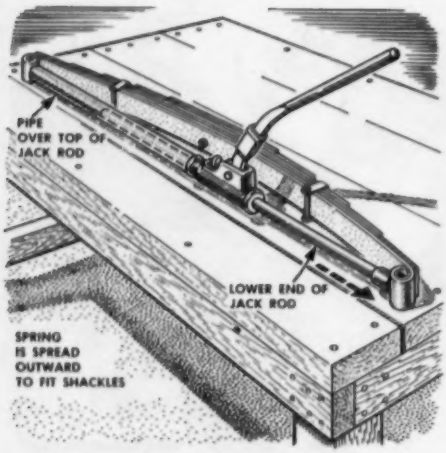
MORE Hints from the Model Garage



This welded angle-iron bumper doubles as a trailer hitch and rear step for a light pickup truck. The assembly was welded to ¼" steel plates bolted to the truck's frame. The ends were shaped by cutting a V notch, bending the angle, and then welding the joint. A ball hitch for a trailer was mounted in the center of the bumper.



Truck owners may save a costly lawsuit by mounting an indicator light on the dash to tell when a van or freezer door is swinging open. Install a push-button switch (the type used on passenger-car doors) on each door and wire them through the ignition switch so that the light won't go on while the truck is being loaded.



Leaf springs can be installed easily by spreading their ends outward with a bumper jack to line up the eyes with the shackle holes. Slip a length of pipe over the top half of the jack bar and work the ratchet against it.

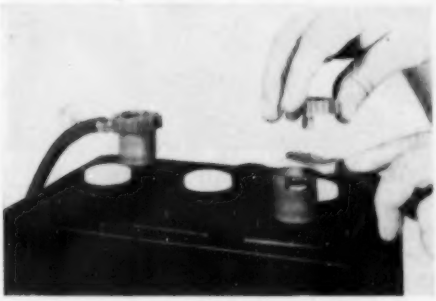
When mounting tubeless tires on standard rims, seal the heads of the rivets or spokes with plastic electrical tape to prevent possible air leaks. Clean the rim, and apply the tape evenly to avoid throwing the wheel out of balance.

New for Your Car

1. Disks Color Tires. Sidewalls take on new color with rubber disks that glue onto the tires. Kolorwalls come in white, blue, green, yellow or pink for 15″ or 16″ tires. A kit includes four or five disks, cement, abrasive, applicator, roller and complete instructions for their use.

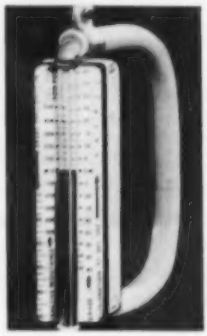
2. Preheater Warms Engine. An electric heating unit that fits into the cooling system keeps an engine ready for quick starts regardless of outside temperature. It shuts itself off when engine operating temperature is reached. Hooking up is simple: hoses from the unit's outlet and intake connect to the car heater line and radiator drain. Uni-Flex, 3″ in diameter by 8½″ high, can be installed in any position, uses AC or DC.

4. Arm Rest Doubles as Food Box. Lift the lid of the portable Thermo arm rest and there's an insulated compartment to keep food hot or cold. It's covered with imitation alligator hide, weighs three pounds.

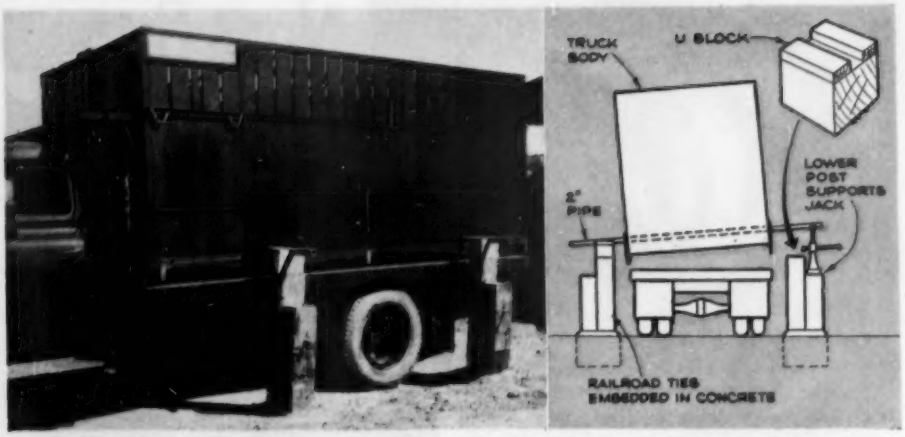


3. Oil Cups Shield Battery Posts. These enclosed terminals slip over conventional battery posts, hold heavy oil which prevents corrosion or sulfate from forming. The terminals require eye-lug cable connections.

5. Gauge Measures Car's Efficiency. Working on the inertia theory, liquid level in the tube rocks back and forth in response to your car's running performance. Continuous readings indicate such things as road horsepower, acceleration and hill-climbing ability. Gauge attaches inside windshield.



Further information on these new car products can be obtained from: 1. Nu-Way Kolorwall, Inc., 1797 W. Adams Blvd., Los Angeles 18; 2. Tech Products, Inc., 615 Pennsylvania Ave., Elizabeth, N.J.; 3. Juno Sales Co., 2946 Los Feliz Blvd., Los Angeles 39; 4. Wallace Brands Co., 20 Broadway, Toledo 4, Ohio; 5. Almquist Engineering & Mfg., 315 Broad, Milford, Pa.

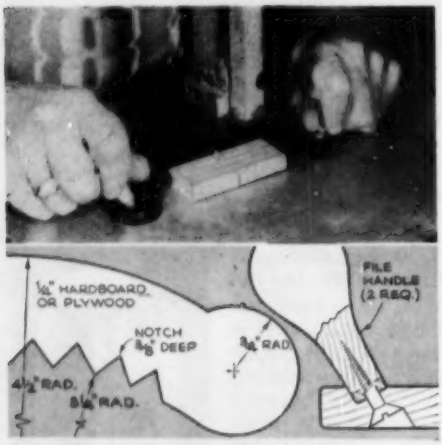


One Man with a Jack Lifts the Heavy Body Off His Truck

JAMES PRATT of Nuevo, Calif., needs no help when he removes the heavy body from his truck. First, he backs up between four sturdy uprights made of old railroad ties embedded in concrete.

After removing six bolts that attach the body to the frame, Pratt slips two lengths of 2" pipe through metal-collared holes in the body aligned with the uprights. Placing a jack on the stepped-down outer section of one of the uprights, he jacks the pipe end up until he can insert a U-shaped block between the pipe and the higher inner section of the upright.

Pratt repeats the operation until the truck body is supported entirely by the posts. Then he climbs in his truck, pulls into the clear, and the monster truck body remains behind, resting securely on the heavy railroad ties.—*Hi Sibley, Nuevo, Calif.*



Saw Pusher Protects Fingers

SMALL work of almost any shape can be safely guided into the blade of a bandsaw with this two-handled pusher. Notches in the curved inside edge grip the workpiece at its corners, permitting more accurate cutting of intricate pieces as well as straight cuts.—*Phil McCafferty, Stanwood, Iowa.*

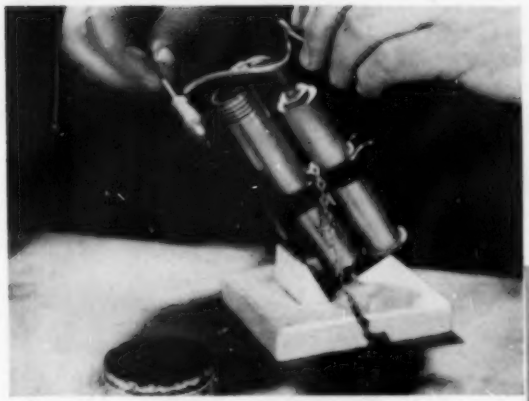
Drilled Dowel Sheathes Awl

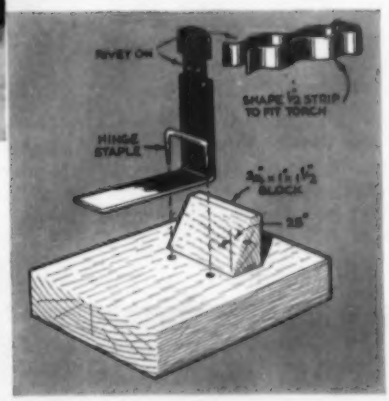
SHEATHE your awl or scriber when you put it away to protect yourself and the tool. The sheath? A bit of dowel drilled part way to provide a snug fit for the tool shaft.—*Frank Javor, North Bergen, N. J.*

Pipe Straps Open Drawers

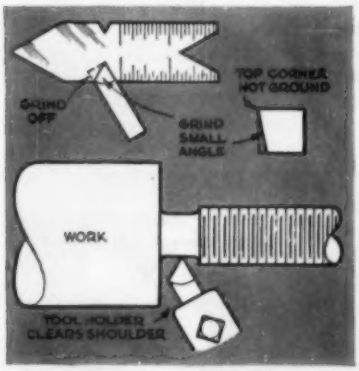
SPARE conduit straps neatly solve the problem of putting handles on workshop drawers if you have no conventional drawer pulls at hand. The straps are just the right shape and are easily screwed onto the drawers.

NEW Shop Ideas



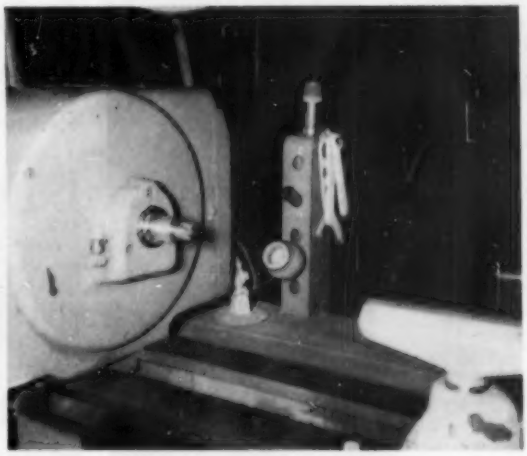


Self-Standing Torch. This mount for an alcohol torch keeps it from tipping over, while leaving both hands free. At a touch it tilts forward, where the torch delivers its hottest flame. The base and angle block are made of wood, the upright and clip from any thin sheet metal. A wide staple bent from coat-hanger wire is driven into the base over the leg of the upright as a hinge pin. The pin holds the mount to the base, yet permits tipping it and the torch forward.—*J. M. Finn, Pittstown, N. J.*



Threading to a Shoulder. The common V-thread tool runs into trouble when it must work close to a large shoulder. I grind mine as shown to get farther in without interference. It is even easier to shape than the usual V tool, for most of the grinding is done at the left-hand corner.

The right-hand edge is left untouched except for a small relief angle that is ground on the side below the cutting edge of the tool bit.—*H. J. Gerber, Stillwater, Okla.*

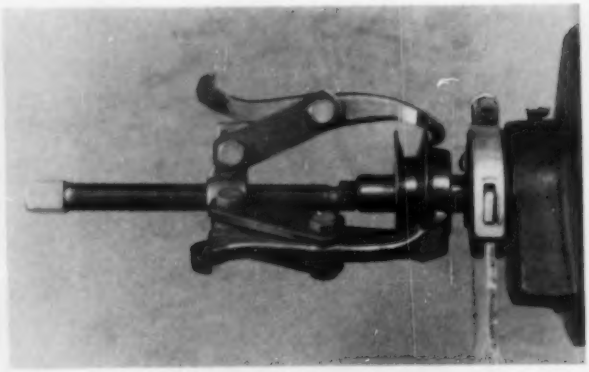


Post Holds Lathe Tools. Instead of leaving lathe centers, wrenches and other accessories under the lathe ways, where they always got buried under piles of chips, I now mount them on a wooden post behind the machine. Five ¾" holes are bored into the wide face of a two-by-three at an angle as sockets for centers and the like.

Wrenches are hung on nails and cup hooks driven into the edge of the post, which is bolted to the lathe bench.—*Adam H. Sabatose, Brockway, Pa.*

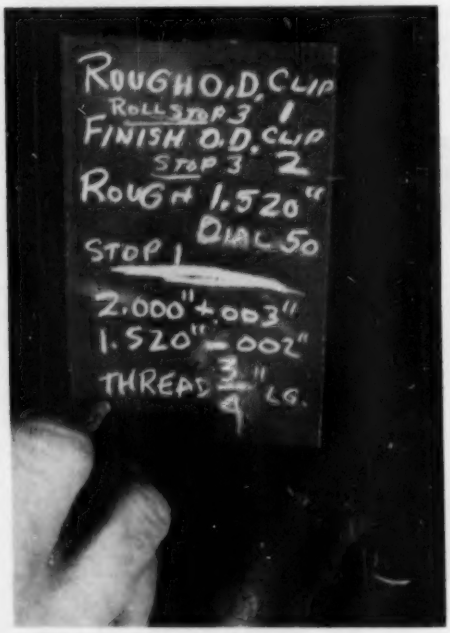
Please turn the page for more shop tips

MORE SHOP TIPS



Protect Shaft Ends. Tightening up a screw-type wheel puller may burr over the end of a shaft, making removal of the wheel or pulley difficult. Placing a nut between the puller screw and the shaft is a simple way to prevent any possible damage occurring to the shaft.—*George E. Leith, Longview, Tex.*

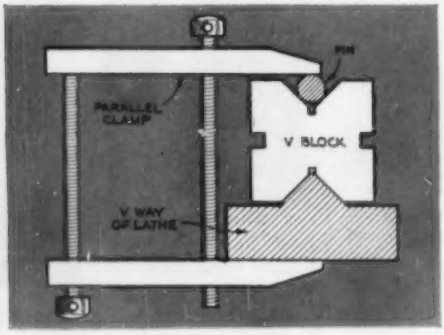
Tape Clears File Teeth. A quick way to clean a fine file is to stick a piece of surgical adhesive tape along it and rub it hard. When the tape is pulled off the file, clogging chips will come right along with it.—*Lillian Koslover, Brooklyn, N. Y.*



Jot Down Work Memos. There's no need to mumble to yourself to remember a dimension or tool setting. Mount a child's slate near the lathe or other tool and keep a bit of chalk handy. Use the plate to write down reminders on such details as successive carriage stops, tool-depth feeds and diameters. —*Phil McCafferty, Stanwood, Iowa.*

Heat Rejuvenates Springs. Although overstretched springs can be pulled back to normal size, they will become distorted the first time they are again flexed. To prevent this, heat them in a kitchen oven at 450° for 20 minutes after reshaping and allow to cool in air. This modest temperature relieves stresses in the steel, restoring the springs' normal elasticity.

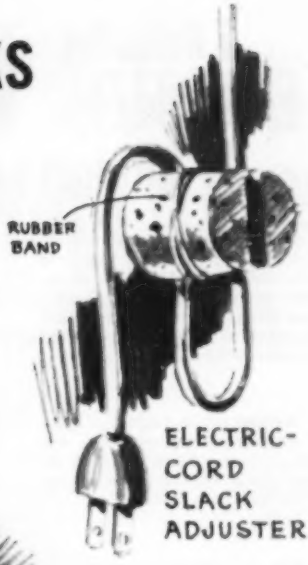
To lengthen a coil spring, stretch it as desired and heat-treat it this same way. To shorten compression springs, tie them to the size wanted and heat. Homemade springs wound from spring-steel wire will be improved by the same treatment. If an oven is not available, polish the steel bright and heat the spring in an open torch flame until the steel just turns purple-blue.



Emergency Carriage Stop. For a lathe with V ways, a carriage stop can be made from a V block. Place it on the front way, lay a pin or rod in the upper groove, and lock with a parallel clamp. Even if you have a carriage stop, this dodge is useful when two of them are needed on certain projects.—*Frank LaSaracina, New York City.*

7 UNUSUAL USES FOR Corks

BASE FOR HOT POTS



ELECTRIC-CORD SLACK ADJUSTER

LIGHT PULL

DRAWING BOARD "PIN CUSHION"

ASH TRAY FEET

BATHTUB SAILBOAT

DART

7 Rules for Putting Up TV Antennas

1 **AIM THE ANTENNA** directly at the station. You may have to compromise on the best direction for the channels you watch most often. Have someone watch the set and let you know when the reception seems best.

2 **MOUNT THE ELEMENTS** at least six feet from any other antennas, power lines, tin roofs or other metal objects to avoid interference from them.

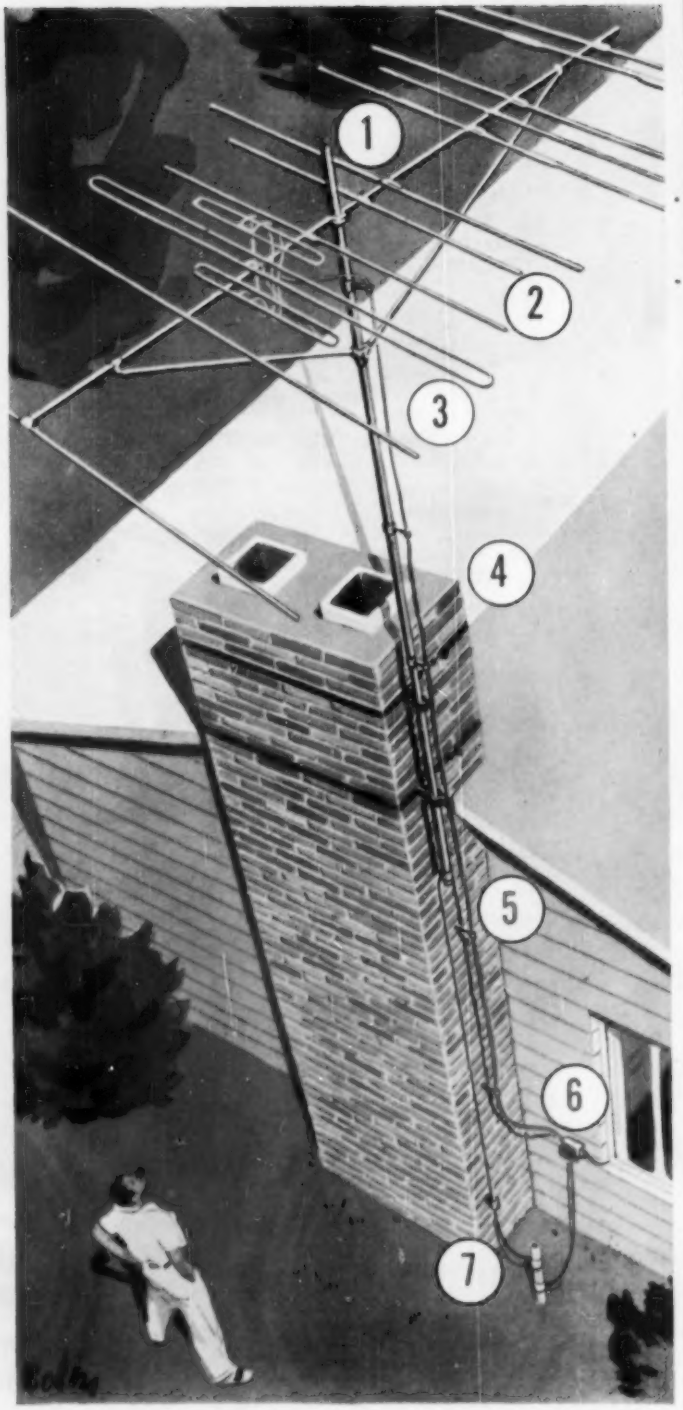
3 **USE A LEAD-IN** of high quality. A cheap cable may produce mismatch, resulting in the loss of signal strength. It's best to renew the lead-in if it is more than three years old.

4 **USE STAND-OFF INSULATORS** on both the mast and house to space the lead-in away from any metal and keep the insulation from wearing away.

5 **KEEP THE LEAD-IN SHORT,** following the most direct route from antenna to set. Surplus line cuts signal strength. Leave just enough behind the set so that you can pull the cabinet away from the wall.

6 **INSTALL A LIGHTNING ARRESTER** on the lead-in where the latter enters the house. Also attach ground wire to the arrester and run to ground rod.

7 **GROUND THE MAST** with No. 6 wire clamped to the lower end and run to a six-foot length of ½" pipe or a commercial grounding rod driven at least four feet into the ground. Sand the pipe and TV mast under the electrical contacts. You can also run ground wires to a water pipe. Never use a gas pipe.



Is Your TV Antenna Worn Out?

A new one, or an overhaul of the old, may brighten the picture and rout those ghosts.

By Matthew Mandl

IS YOUR television picture weak and unstable? Does your reception seem to be poorer today than a few years ago? Are ghosts and snow sneaking in where they have no right to be?

If so, the fault may be a worn-out antenna. You may think of this as a bunch of metal arms with wires attached that nothing much could happen to. Actually, your antenna is a delicate electronic system that must generate tiny, precisely matched amounts of current and deliver them to your set to give you a picture.

Like any device exposed to the elements, an antenna deteriorates to the point where one several years old may be a major cause of inferior reception. Usually the loss of quality is so gradual that you may not be aware of it.

Your existing antenna may also be an old-style type with insufficient gain—ability to increase signal strength—and thus incapable of rejecting signals which cause interference.

Overhauling your old antenna or adding a new one may thus do wonders to improve your picture—without your even touching the set.

Renewing the old. Since many faults will not show up except under close inspection, it's best to start by removing the antenna to the ground where you can work on it safely and leisurely.

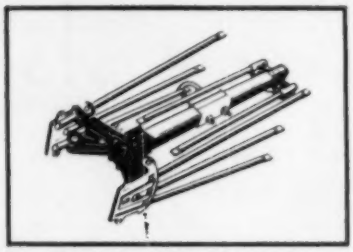
After weathering for several years, electrical connections may have become loose and one or two of the elements may have fallen out of the assembly. Bolts often rust through and break. In other cases, high winds may have bent the elements from their correct position, affecting their performance.

Rain, chimney soot, salt air and smog all contribute to the

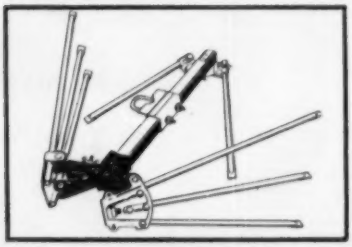
Mr. Mandl is the author of Mandl's Television Servicing *and* Hearing Aids, Their Use, Care and Repair, *and is co-author of* Television & FM Antenna Guide. *He is currently lecturer in electronics at Temple University.*

New antennas are easier to put up, pull in more picture to see

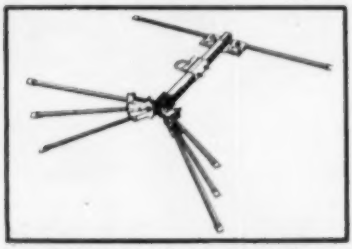
VHF ANTENNA, covering channels from 2 to 13, comes assembled and snaps open in an instant. This conical type, made by JFD, can be used singly in strong-signal areas or in stacks up to three for distant reception.



IT COMES FOLDED IN CARTON



ARMS SNAP OPEN BY SPRINGS



ELEMENTS LOCK IN POSITION

rusting and corrosion of the elements. Even aluminum rods corrode when exposed to some of these conditions. Insulators that have cracked, absorbing moisture, or have become coated with dust and soot, no longer retain their nonconductive properties, and the picture signal loses strength.

The lead-in itself may cause poor reception. If yours is over three years old, the chances are it isn't performing as it should. The plastic insulation becomes brittle and cracks, permitting leakages between the two wires that upset the delicate electronic balance.

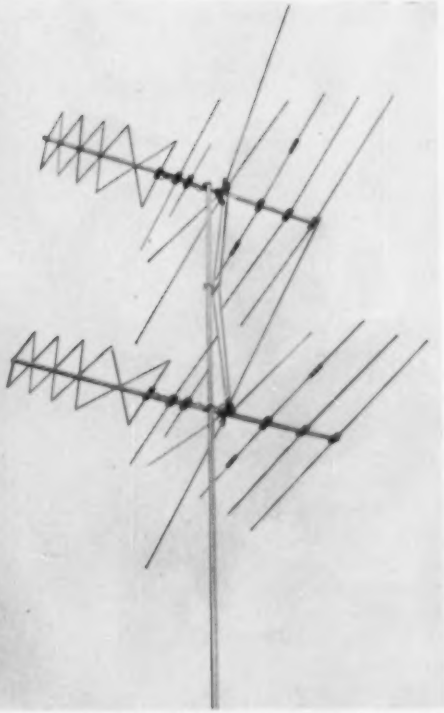
What you can do. If the antenna insulator is intact, it should be cleaned with carbon tetrachloride to remove any dirt that has built up on it. Also remove the clamp sections that hold the antenna rods. If either the clamps or the rods are corroded, sandpaper or wire-brush the parts to make a good electrical connection.

Rusted bolts should be replaced with galvanized or copper ones. You can try to straighten any elements that are out of position, but be careful not to crack the insulators. If they're bent too badly, your best bet is to discard them.

If the lead-in has been up a year or so and looks healthy, you can restore it by cleaning to remove caked-on dirt. Crop off the old ends so you'll have clean, unbroken new wire to attach to the terminals.

Attaching the lead-in. The insulation should split down the center just so far

UHF CORNER REFLECTOR has a bent-metal grid to increase receptivity in weak-signal areas. An Amphenol make, it receives all channels from 14 to 83. Similar JFD model (inset) has a "bow-tie" dipole backed by a radarlike parabolic reflector. Both types are highly directional in sensitivity and need accurate aiming.



COMBINATION VHF-UHF ANTENNA brings in both very-high-frequency channels from 2 to 13 and ultrahigh-frequency channels from 14 to 83. The JFD model combines both flat-plane conical and flat-plane helical designs. It comes assembled, can be used singly or stacked in pairs for better reception in fringe areas.

that the ends can be fanned out and secured to the antenna posts. Strip only enough insulation to permit good electrical contact. The remaining insulation on the split portions will prevent shorts and make them more rigid.

The lead-in should then be carried down the mast through a series of standoff insulators, with the first placed as close to the split end as you can to prevent flexing and breaking in a high wind. If your original lead-in was simply taped to the mast, a lot of trouble may have been there—you must keep the transmission line away from all metal parts to avoid interference.

To prolong the life of the antenna, you can coat it with a plastic film such as the kind that comes in spray cans. Cover all the elements including the insulator. This protects against rust as well as preventing leakages caused by moisture or high humidity.

If you have a motor to rotate the antenna, the housing should be removed and the parts lubricated. The four-conductor motor cable usually has a clear-plastic insulation that is more readily affected by sun than the darker type of lead-in. Cracks and splits frequently occur after a few years, and the cable should be replaced.

Installing a new antenna. Many stations have increased their power during the past few years, modern receivers have much more gain, and higher-gain antennas are now available.

Many companies are now offering the

assembled antennas that "snap up" into proper element position when ready for installation. Some antenna kits include the complete antenna plus necessary hardware, stand-off insulators, mast sections, leadin and other accessories.

With a kit like this, a new antenna can be installed quickly and easily by anyone who isn't afraid to climb a ladder.

The popular bi-conical antenna is a good broadband antenna for channels 2 to 13 and has fairly good signal pickup for metropolitan areas. When two such types are stacked, good reception for distances up to 50 or 60 miles is possible. The bi-conical type of antenna is extremely sensitive to direction and requires a motor to aim it if television stations are located in different directions.

Another popular antenna is the motorless type which has a multiconductor line that selects the direction of signal pickup by a switch at the receiver. Its gain is comparable to that of the bi-conical type and it is suitable for use in metropolitan areas.

WOOD SHIM makes it easy to mount an antenna mast on a chimney with an overhanging cap. Strap a two-by-four to the chimney first, then fasten on the mast clamps with lag screws into the wood.

Fringe reception. Where signal strength is weak and stations are up to approximately 100 miles away, the newer-type Yagi antennas should be used. These are multielement antennas which provide exceptionally high gain.

Many other improved antenna types are also available and give much better reception without an increase in installation height over older antennas. In some instances, the newer types will outperform the older antennas even at a reduced height. Height, however, is still an important factor, and in an area that is known to have poor signal strength, the antenna should be installed as high as possible within the limits of safety and resistance to wind.

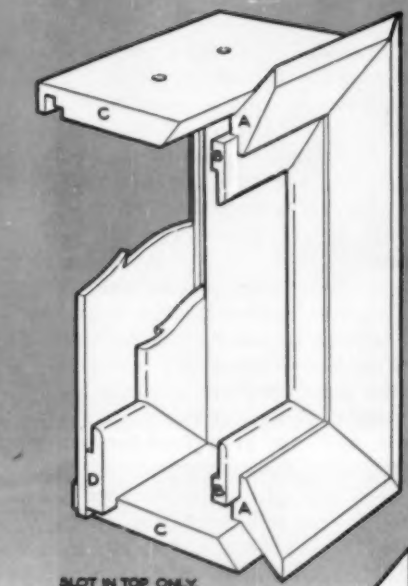
UHF reception. UHF signals (all channels above 13) suffer more losses than VHF signals and thus cannot usually be received over as great distances. Best results are assured by using the Yagi (multielement) types and also the "bow-tie" corner-reflector types.

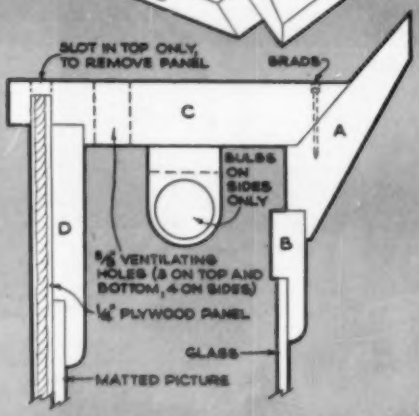
It is not good practice to attach a UHF antenna and a VHF antenna to a single common transmission line because each one "loads" down the other, and reception for both is poorer. If you need both a UHF and a VHF antenna, you can reduce losses by using a separate transmission line for each antenna, or by using a single line with a crossover network that minimizes the tendency of one antenna to affect the other.

It is even more important to mount UHF antennas high and clear of surrounding objects than VHF antennas. High-gain antennas are particularly sensitive to the direction of the pickup and must be carefully aimed at the station.

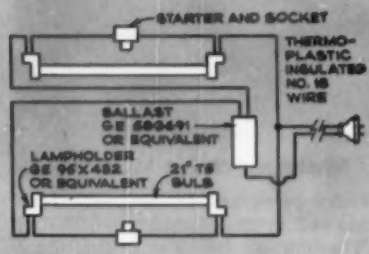
Indoor antennas. In many metropolitan areas VHF signal strength is sufficient for good reception with an indoor antenna. The indoor types, however, pick up more interference because they are lower. Thus, an outdoor installation may be necessary to minimize streaks in the picture caused by auto ignitions, vacuum cleaners and other electric devices.

You may also be able to improve your reception with some of the newer indoor antenna types that replace the old rabbit-ear units. These have phasing bar elements and selector switches to provide better impedance matching between the indoor antenna and the receiver. END





SECTION AND SIDE-VIEW DRAWINGS show how sub-frames are assembled to form the light box and mountings for glass, photo mat and panel.



WIRING DIAGRAM for fluorescent lamps. Mounted on inner faces of sub-frame C, the tubes won't show.

Frame Spotlights Prize Photographs

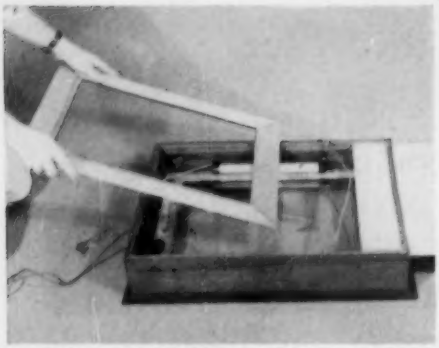
You can switch pictures in a jiffy with this fluorescent shadow box.

THIS deep picture frame displays your favorite camera studies in the even light of concealed fluorescent lamps. When you tire of one print—presto—a sliding panel at the back of the frame permits a quick change to a new picture.

As shown in the cross-section drawing, the picture frame is made up of four sub-frame assemblies: A, B, C and D. The outside dimensions of sub-frame A are 23¼" by 27¼"; sub-frame B, 18½" by 22½"; C, 21½" by 25½"; and D, 20⅝" by 24⅛". Glue molding templates scaled up from the drawing to the ends of the stock to be cut. I used solid Honduras mahogany for all of the framing parts, but any attractive hardwood will do.

Run off the bevel cuts, grooves and rabbets on a circular saw. Quarter-round the inner edges of moldings B and D with sandpaper, after making preliminary bevel cuts. Miter the ends of all parts and assemble sub-frames A, B and D with glue and small brads.

Before assembling sub-frame C, continue the rabbet at the rear through the top mem-



YOU SLIDE THE BACKING PANEL UP to change pictures and also to remove sub-frame D so you can insert a new tube or starter easily. It's also handy for cleaning the picture glass.

ber, to form a slot through which a ¼"-plywood backing panel can be removed for picture changing. Also, drill holes through all four sides of this sub-frame to act as ventilators for the fluorescent lamps.

Glue sub-frames A and B together. Then glue and brad sub-frame C to A. Sub-frame D is not attached to C, but is held firmly in place in the rabbeted recess by the backing panel.

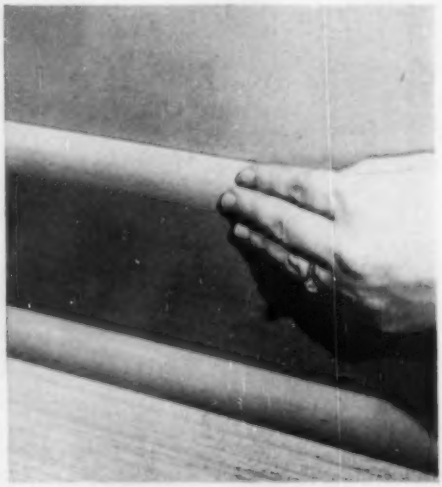
This removable feature of sub-frame D will make it easy for you to replace burned-out lamps, starters, or a broken picture glass.

I used four lamps in my illuminated picture frame, but two are adequate. Best for this use are the 21", T5 type, which have a tube diameter of ⅝". To recess them so they will not show, buy the fittings (four lamp holders, one 28-watt ballast, two starters and two starter sockets) separately, and mount them directly on the inner faces of sub-frame C. Thread the light cord out through the central ventilating hole in the bottom of the frame and cut in a feed-through switch at a convenient height.

Sand and finish the frame to harmonize with its surroundings. Finally, with sub-frame D removed, insert picture glass in B and secure it with glazier's points.—*Ben Ball, Jr., Groves, Texas.*

Sofa Units Hooked Together

SECTIONAL sofa units won't drift apart if you tie the frames together with hooks and eyes. Be sure to allow for the thickness of the upholstery when setting the eyes.—*Thomas P. Ramirez, Fond du Lac, Wisc.*



Plank, Molding Trim Wall Base

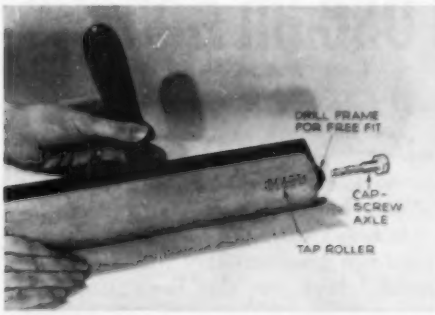
A MODERN baseboard can be made from ¾" shelving and quarter round, assembled as shown. The curved top keeps dust from catching, makes the baseboard easy to clean. —*Frank A. Javor, North Bergen, N. J.*

Five Darkroom Tips

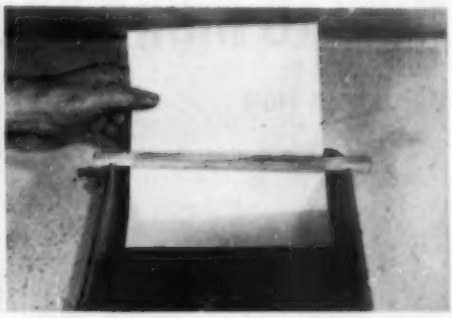
1 TRAY BOOSTS SINK SPACE. Does film washing slow you down by cluttering up your darkroom sink? An enameled stove tray, located like the one at the left, will give you extra working surface. Drill two or three holes near the deep end of the tray and place it so the water overflow will drain back into the sink.

2 MAGNETS STEADY EASEL. Does your easel skitter after you get it set just right for duplicate printing? Stop it by covering the enlarger table with a steel sheet and cementing magnets to the easel bottom. Coat the metal with non-reflecting paint. The magnets steady the easel yet still allow you to shift it.

3 EDGE LIGHT REVEALS DUST. Even a careful brushing may leave some dust on a negative, resulting in spots on the prints. To see if you've missed any dust, check the negative in the dark by directing the beam of a flashlight across the surface. Edge-lighting will make remaining dust on the film stand out clearly.



4 WRINGER ROLLER SQUEEGEE. You can make a king-size, heavy-duty darkroom roller from a discarded clothes wringer and a frame bent out of channel iron. Cut the roller to fit, tap its shaft ends for cap screws, and drill holes in frame legs to clear screws. Bolt on a tool handle and your roller's in business.



5 STRIP DUNKS PRINTS EVENLY. A hardwood strip hooked near one end of a developing tray will guide paper into the soup, eliminate spots and streaks caused by uneven dunking. Saw, file, or carve notches in stick for tight fit on tray flange, then sand stick glass-smooth. Slide in paper between the strip and tray rim.

How to Make and Use an Abacus

By Darrell Huff

YOU can—right this evening in your own workshop—turn out a device that's capable of outfiguring a $700 electric calculating machine.

It's the ancient Oriental abacus, a simple frame in which colorful wood beads slide on thin dowels. The type shown here is similar to one with which a skilled Japanese abacus operator took on an American using a high-speed calculator. The abacus won four to one in addition, subtraction and division, coming in second only in calculating multiplication.

You may not want to outrace an electric computer, but you can use an abacus to do long, error-inducing jobs such as adding big columns of figures.

It helps with the bills, too. Want to total up those monthly bills or make a quick check on the bank statement? Without even writing down the numbers first, you can just enter the amounts on the abacus, and the final figure will be the total. The abacus makes a running total as you go along.

It's also a perfect gift for youngsters

learning arithmetic. Watching the numbers take shape under their fingers helps them *see* arithmetic.

Seven schools in the Milwaukee area have been teaching this way—and are turning out kids who *love* arithmetic.

It's also a lot of just plain fun. It could make your bridge and canasta scoring easy and accurate.

How it works. In principle, the abacus is just an adding machine without gears connecting the columns. The columns, from right to left, represent units, tens, hundreds, thousands, and so on, as in written arithmetic.

The horizontal crossbar is the axis along which calculations are made. Beads representing numbers are moved down from the top against the bar and up from the bottom. All other "neutral" beads are left against the top and bottom rails.

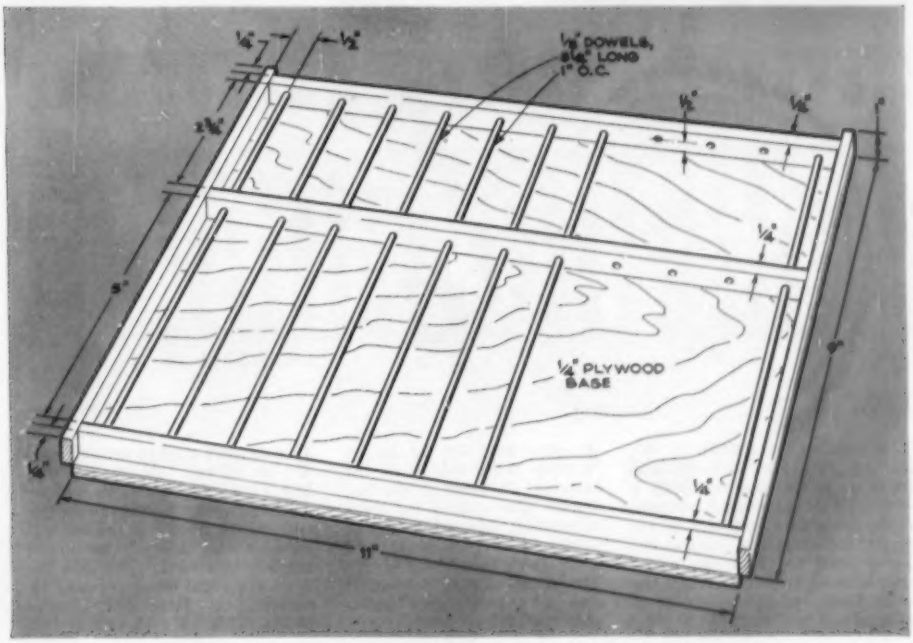
The five ¾" beads below the crossbar on each of the 11 dowels have a value of 1 and the two on each dowel above the bar a value of 5. Operation is simply a system of setting up beads along the crossbar and then adding or subtracting more beads to get the answer.

The pictures on the next two pages show how to add and subtract. For more advanced work, you can get an instruction booklet called *Bead Arithmetic** for 60 cents postpaid.

**Service Supply Co., 831 Grant Ave., San Francisco 8.*

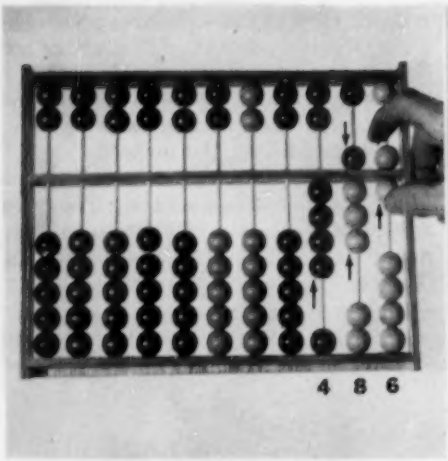
How to make the frame for the abacus

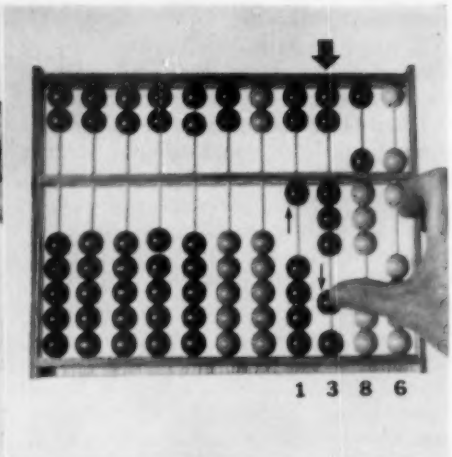
FRAME RAILS are thin strips glued and nailed to ¼"-plywood back. Pad the clamp jaws (right) to avoid marring the wood. (Back was removed in some photos here to show beads better.) The ⅛" dowels pass through center, but end in blind holes in top and bottom rails. Arrange beads—you need 77—in different-colored columns, but don't mix colors in any one column.



Please turn the page to see how to add and subtract

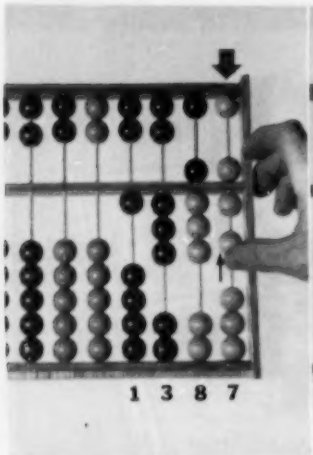
How to add

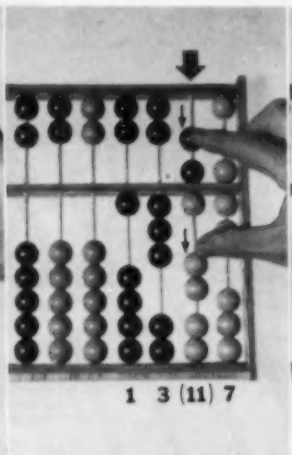


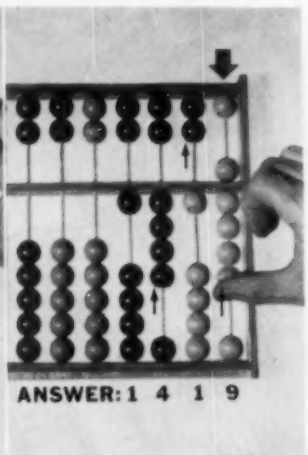


1 THE PROBLEM: Add 486 plus 901 plus 32. Begin by representing the first number, 486, along the crossbar, starting in the third column from the right. Use four lower beads for the 4, three lower beads and one upper one for the 8, and one lower and one upper bead for the 6. Remember that the upper beads are worth 5, the lower ones 1. The number on the abacus now reads 486, as the picture above shows.

2 START ADDING the 901 at the *left*, not the right. Adding 9 to the 4 already on the abacus gives you 13, so move one bead down in the third column from the right, changing the 4 to a 3, and move up one bead in the fourth column, making 13. Another way to add 9 is to think of it as adding 10 and subtracting 1. Move up one in fourth column (adding 10) and one down in third (subtracting 1).





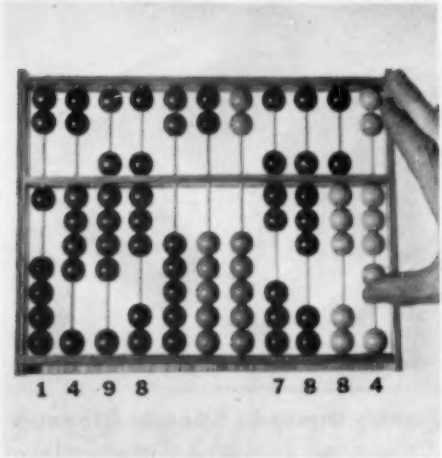


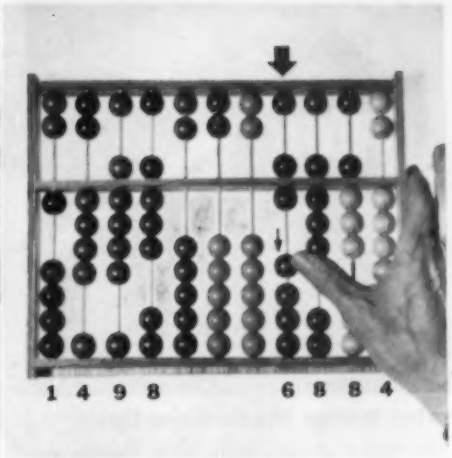
3 SINCE THE NEXT DIGIT in 901 is 0, you don't have to add anything in that column. Add 1 to 6 in the right-hand column by pushing up one lower bead. Arrow indicates the column being worked on. You can make your own pointer by bending a small U-shaped tab of metal to slide along the top rail.

4 NOW ADD THE 32, beginning with the 3 in the second column from the right. This should be done by moving down the second upper bead (worth 5) and subtracting two lower beads. The total in this column is now 11 (two upper beads plus one lower one).

5 BUT THIS MAKES MORE THAN 10, so you "carry over" the first digit (1), just as in written arithmetic, by taking away the two upper beads in the second column and adding one lower bead to the third. Then add the 2 in the right-hand column by moving up two more lower beads. This gives 1,419.

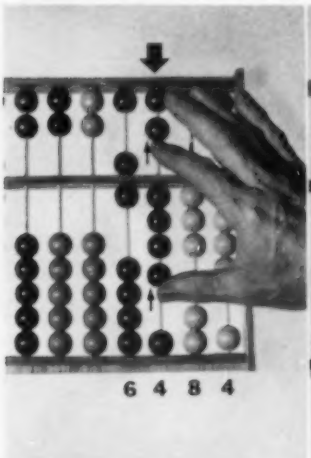
How to subtract

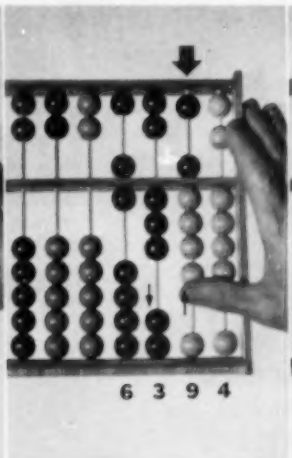


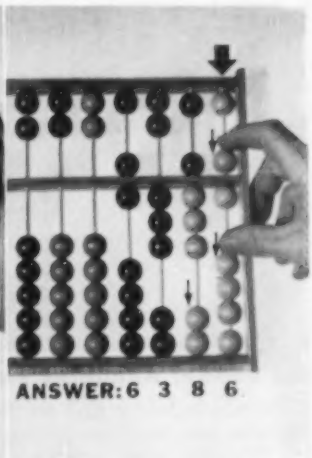


1 THE PROBLEM: Subtract 1,498 from 7,884. Represent the 7,884 along the crossbar at the right-hand side of the abacus. Place the 1,498 at the left-hand side, just to remember it. As in addition, each column is worth 10 times the column to its immediate right—units, tens, hundreds, thousands and so on. Good fingering practice is to move lower beads with your thumb, upper beads with index or middle finger.

2 START SUBTRACTING from the left, as in addition. Take 1, the first digit in the number 1,498, away from 7, the first digit in the number 7,884. Do this by moving down one lower bead in the fourth column from the right, leaving 6. As you subtract each digit, you can remove the corresponding one from the left-hand side of the abacus as a reminder to show you just how far you have progressed.







3 IN THE NEXT COLUMN to the right, take 4 away from 8 by canceling (moving up) the upper bead (which is worth 5), and then adding one lower bead (subtracting 4 is the same as subtracting 5 and adding 1). The upper bead is now removed from the crossbar, and the new number reads 6,484.

4 THE NEXT STEP is to subtract 9 from 8 in the second column from the right. Since you don't have enough beads to subtract from, "borrow" 10 from the third column by moving down one lower bead. Then add one lower bead to the second column to make the 9.

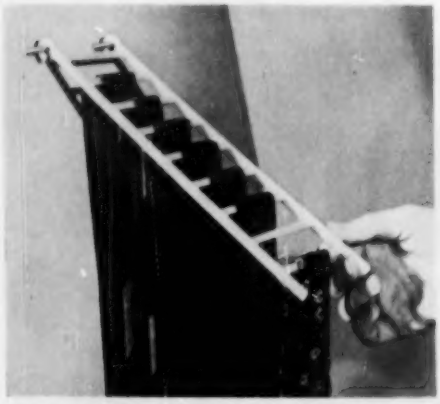
5 NOW SUBTRACT the final 8 from the 4 in the right-hand column. Again borrow 10 from the column to the left, subtracting one lower bead making it 8; then add to the right-hand column to make 6. To add the 2, add one upper bead and subtract three lower beads, giving the answer—6,386.

Paint Roller Made from Spool

A SMALL thread spool with flanges removed and the finger of an old wool glove form this tiny roller for painting wood edges or other small areas. The axle is a ¼" dowel inserted into a ½"-dowel handle. Taping the axle's end keeps the spool on. Cut the pan from the side of a gallon can.

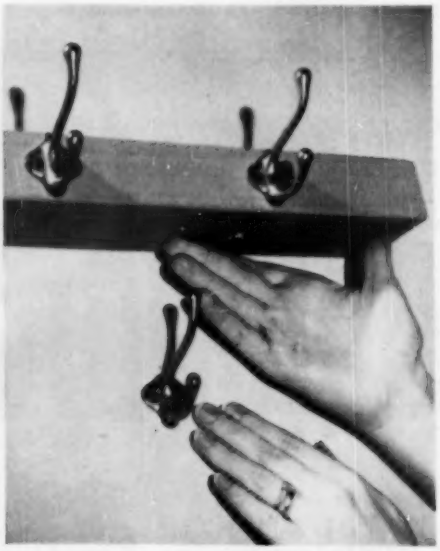
Jumbo Dustpan Speeds Cleanup

A KING-SIZE dustpan made of scraps helps you clean up wood chips and sawdust in a hurry. Use one-by-fours for the sides and hardboard for the 18"-by-24" bottom. Bevel the front edge of the hardboard and put rubber bumpers on the bottom at the rear of the dustpan to make it tilt forward.



Bird Ladder Becomes Tie Rack

THIS plastic ladder isn't for the birds—it holds your ties. You can get one at a dime store. Hook the ladder into two screw eyes.—*Frank A. Javor, North Bergen, N. J.*



Second Tier Gives Extra Hooks

YOU can double the number of coat hooks in a given wall space by screwing a second row of hooks, on a two-by-four, to the wall. Secure the two-by-four with angle brackets. The added four inches gives ample clearance.

Old Foam Rubber Pads Chairs

A SUPPLY of foam rubber for padding furniture can be removed from the seats of junked autos. One car yields enough suitable material to pad about six chair seats.—*Bob Johnson, Lakewood, N. J.*

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Print your own snapshots . . .

. . . and do it the easy way with a Kodak Photo-Hobby Outfit

It's a thrill to watch a blank sheet of paper change into a familiar snapshot scene right before your eyes. And with a Kodak Photo-Hobby Outfit that thrill can be *yours*.

If you're a beginner—you'll like the simple, compact, "no-fuss" versatility of the new do-it-yourself Photo-Hobby Outfits. With Velite Printing Paper, for instance, you don't even turn off the room lights in order to print sparkling snapshots. Just subdue the brightest lights, add water to three chemicals, and start printing. To develop negatives you darken a room long enough to place a roll of exposed film in the developing tank, then switch on the lights. The chemicals do the rest.

If you're an experienced amateur—a Photo-Hobby Outfit can be a handy time-saver for making your "proofs." As for the extra pictures other members of the family want, here's a thought: With a Photo-Hobby Outfit, they can print their own snapshots and photo-greeting cards. Best of all, they'll enjoy doing it!

Now—read the details below.

New Kodak De Luxe Photo-Hobby Outfit

$16.95

Similar Outfit with Printing Frame instead of Photo-Hobby Printer

$9.95

Here's what you get in this outfit—1. A Kodak Photo-Hobby Printer, Model A, with a built-in lamp socket (takes a 60-watt lamp for Velite Paper, or 15-watt lamps for other Kodak contact-printing papers); a hinged platen, red safety light, switch for controlling exposure time. 2. Kodacraft Printing Mask Set with openings to fit all popular-sized negatives. 3. Kodacraft Roll-Film Tank with two aprons for 127 and 620-120 film sizes. 4. 16 ozs. liquid Kodak Versatol Developer. 5. 16 ozs. Kodafix Solution. 6. Six 8-oz. packets of Kodak Universal Stop Bath. 7. 100-sheet package of 2½" x 3½" Kodak Velite Paper. 8. 4-oz. plastic measuring cup. 9. Three 5" x 7" Tenite Rocker Trays. 10. Kodak Glass Stirring Rod. 11. Kodak Darkroom Thermometer. 12. 2 Plastic Film Clips. 13. Blotter Book for drying prints. 14. Viscose Sponge. Also, Simplified Instruction Card.

New Photo-Hobby Outfits feature "Do-It-Yourself" Instruction Cards

Packed with each of the two outfits described on the previous page is a big 11 x 14-inch card. On one side are simple 1-2-3 instructions for *developing* negatives . . . the other side for *printing*. You can't miss. It's the easiest-to-follow guide you've ever seen.

P. S. for Christmas—Either one of the new Kodak Outfits makes a wonderful gift for snapshot fans of any age. Want one for yourself? Drop a hint in the right place—now! Want one for someone else? You'll be making someone very happy!

When you need more Photo-Hobby Outfit materials . . .

Next time you visit your photo dealer, ask him to show you the Kodak chemicals that have been prepared for do-it-yourself hobbyists. Some of them come in ready-mixed liquid form. Others are in handy foil packets—you simply mix the powder with water and it's ready for use. Here are several chemicals particularly suitable for home use. (The first two are Photo-Hobby Outfit liquid chemicals you'll want to replace, along with Velite Printing Paper, before your original supply runs out.)

Kodak Versatol Developer—An economical "all-purpose" developer. Dilute 1:7 (1 part developer to 7 parts water) for developing negatives in a tank. For clear, sparkling prints, dilute 1:3. 8-oz. bottle, $.35. Quart, $1.

Kodafix Solution—A concentrated hardening-fixing bath which makes the images permanent on film and paper. Requires only the addition of water to prepare it for use. Quart bottle (to make 1 gallon), $1.

Kodak Microdol Liquid Developer—For even finer-grain negatives (hence finer-grained prints) than an all-purpose developer can provide, use Microdol for developing your *negatives*, and Versatol (see above) for developing your snapshot *prints*. Microdol comes ready for use without dilution. 1 quart, $1.

Kodak Rapid Selenium Toner—Usable at various dilutions to give your snapshot images permanent cold-brown tones. 8-oz. bottle, $1.05.

Kodak Brown Toner—Dilutes 1:32 to give snapshot images warm-brown tones. 8-oz. bottle, $.90.

Kodak Photo-Flo Solution—Highly concentrated wetting agent that lets water run off film and paper surfaces without leaving water marks and streaks. Note to 35mm users: As you may know, 35mm film differs from paper-backed roll film in that it has gelatin on one side and a plastic base on the reverse (instead of gelatin on both sides). Kodak Photo-Flo does a remarkable job in wetting *both* the plastic base and gelatin surface to let the water run off without leaving streaks or spots. No need to even sponge the film. 4-oz. bottle (to make 6 gallons), $.45; 16-oz. bottle (to make 24 gallons), $.90.

Ask to see the handy foil packets of Kodak chemicals, too.

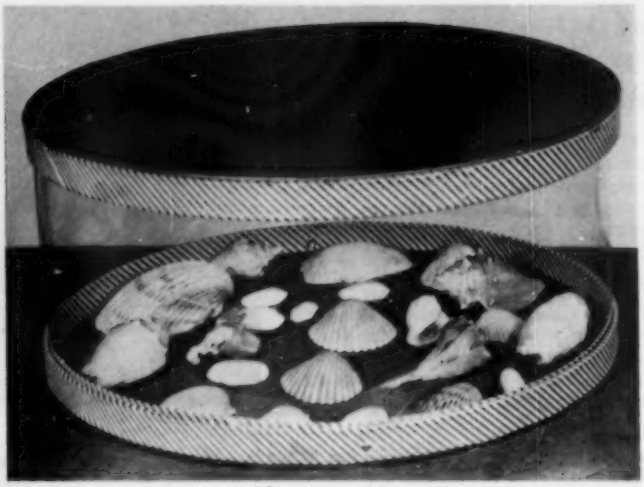
Prices are list, include Federal Tax where applicable, and are subject to change without notice.

Kodak

Eastman Kodak Company
Rochester 4, N. Y.

Kids' Showcase Is a Hatbox

KIDS will get a big kick out of having a display case for the sea shells they salvage. Mom will be glad to supply one of her plastic hatboxes; it also prevents torn pockets and keeps the shells from being scattered about.—*H. Leeper, Canton, Ohio.*



Tire Puts Bounce in Horseshoes

PITCHING horseshoes can be made safer for kids by providing rubber ones hacksawed in 1" slices from an old tire.—*John Krill, North Lima, Ohio.*

Tile Serves as Palette

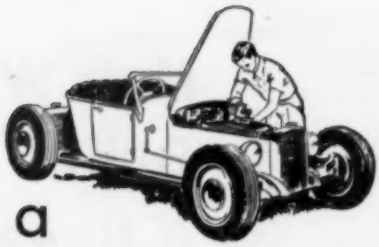
DON'T throw away those extra pieces of plastic tile. They make hard-to-beat palettes for the amateur artist. Use them to mix oil or water colors next time you play painter.

Magnifier Gets a Gooseneck

NEED a support for your magnifying glass? Make an adjustable one from an old gooseneck lamp. Remove the socket and cord and insert a length of dowel into the gooseneck. Screw the magnifier into the dowel and the glass is ready for use.—*H. J. Kennard, Gonzales, Tex.*

Calipers Hold Model Parts

PAINTING model parts is easy if you hold them with calipers. Then use tweezers to lean the drying pieces against a block.—*Walter E. Burton, Akron, Ohio.*



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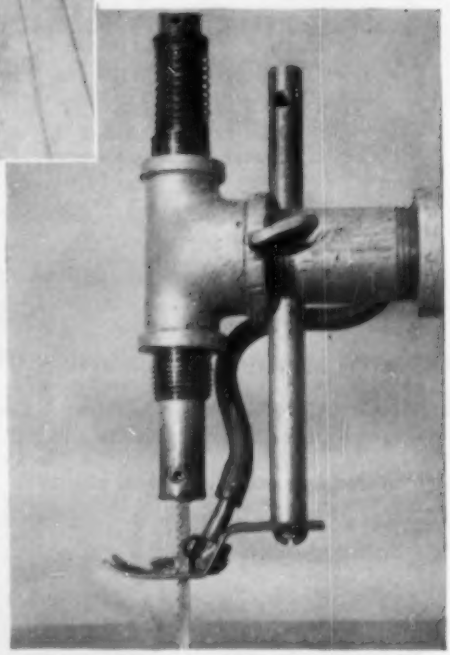
How We Built A Jigsaw

By Julius Nauta and John Ferry

BY BUILDING a jigsaw around a junked compressor, you save half the work. The up-and-down motion of the compressor's piston drives the saw blade, the cylinder casting supports the saw table, and air compressed on the piston's down stroke blows sawdust off the work.

You can buy an old compressor for a dollar or so. Clean it with solvent or degreaser and remove the cylinder head and valve plate. Drill and tap four 10-32 holes in the top of the piston for attaching the chuck. Make the chuck from a ¾″ piece of 1¼″ steel rod. Drill a ¼″ hole in its center to hold blades or machine files and drill and tap four holes converging at the center hole for setscrews. Drill four clearance holes for the mounting screws and fasten chuck to piston.

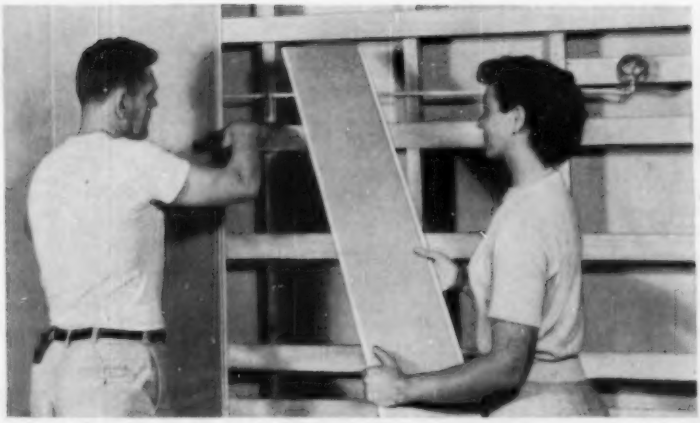
For the table, first drill a ½″ hole in the center of a 14″-square piece of ¼″ aluminum. Then drill mounting holes to match the bolt holes in the top of the cylinder and fasten it in position with flathead machine screws to fit the threads. Use ¾″ pipe nipples, 1″ long, to raise the table clear of the chuck. Bolt the compressor to a 12″-by-20″ base which is made of two thicknesses of ¾″ plywood.



OVERARM HEAD is a pipe tee with a short nipple screwed to top and bottom threads. After assembling, these nipples are reamed ⅝″ to align their inside diameter. A round-head bolt is set in the crook of the hold-down foot so the slot can act as the blade guide.

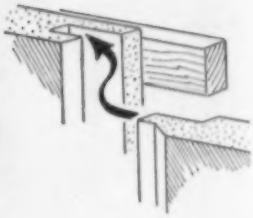
The overarm is a plumber's nightmare, but it's sturdy. Assemble the components first, then position the pipe flange on the base so that the center of the T head is directly over the hole in the chuck. After

[*Continued on page 244*]



Easy-to-handle Temlok Plank goes up fast by stapling or nailing. Once pre-finished Temlok is installed the job is done—no painting or further finishing is necessary.

Lok-Bevel joint hides staples or nail heads, speeds installation, and provides neat, even joint lines.



How to Build a Basement Game Room with Temlok Tile and Plank

You can do the job yourself, easily and economically, by installing Armstrong Temlok® Tile on the ceiling and Armstrong Temlok Plank on the walls. These attractive interior finishes rapidly turn an unused basement into extra living space because they build, decorate, and insulate in one application.

Start by framing the foundation walls with 2" x 4" studs on 24" centers. Then apply 1" x 3" furring strips, one foot apart.

Next, nail or staple Temlok to the furring strips. The exclusive Lok-Bevel® joint on both Temlok Tile and Plank has an extra wide nailing flange for quick, easy installation. For sturdy lower walls, use Armstrong Temwood® backed up with Temlok Wallboard.

Armstrong Temlok interior finishes are handsomely pre-finished. Temlok Tile is available in Snow White or Light Ivory; sizes, 12" x 12", 12" x 24", 16" x 16", 16" x 32". Temlok Plank comes in a random Suntan Blend; sizes, 8", 12", and 16" wide—8' long.

For complete details, see your local lumber dealer. He'll be glad to give you help with your remodeling plans.

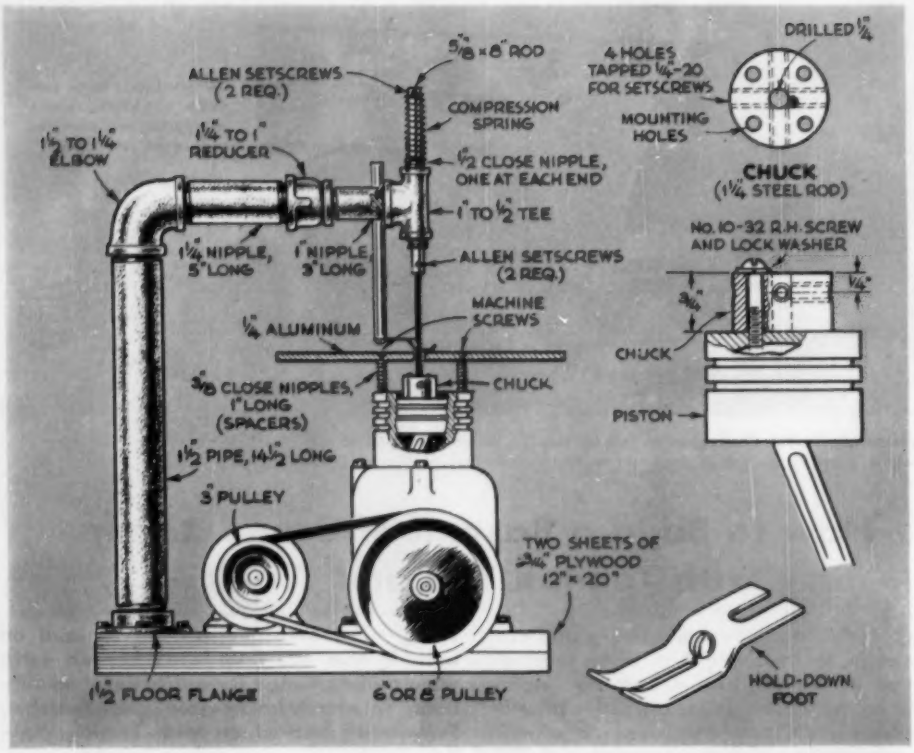
Basement game room is attractively finished with Temlok Tile and Plank. They offer a fast and economical way to turn wasted cellar space into comfortable living areas.

Send for free booklet, "New Ways to Remodel Your Home." Just write Armstrong Cork Company, 3511 Washington Avenue, Lancaster, Pennsylvania.

Armstrong

TEMLOK

Cushiontone® • M-67® Monowall® • Insulating Wool Hardboards • All-Purpose Cements



[*Continued from page 242*]

the flange is bolted down, the head can be aligned perfectly by screwing the pipe nipples on the overarm in or out.

Drill a ¼" hole in one end of an 8" length of ⅝" steel rod to make the upper chuck. Drill and tap a transverse hole through the center hole for two setscrews to grip the top of the blade. Drill a similar hole at the top of the rod for two setscrews, about ½" long. Turn them tight against each other so their ends project and rest on compression spring.

Drill a vertical ½" hole through the front nipple, just behind the T, for the hold-down-foot rod. Drill a transverse hole for a thumbscrew. Make the hold-down-foot from 1/16" flat steel and fasten a round-head bolt to it so that the slot in the bolt head serves as a blade guide.

A blower to keep sawdust off the cutting line is a nice refinement. Slip windshield-wiper hose over the compressor's intake shut-off valve or drill into the side of the crankcase for an air fitting to take advantage of air forced into it on the piston's downstroke. Run the hose through holes drilled in the overarm and end it with a piece of partly flattened tubing aimed at the cutting area and soldered to the hold-down foot.

Bolt a 1/6- or ¼-hp. 1,725-r.p.m. motor in place behind the compressor and mount a toggle switch on the base.

When cutting pieces within the capacity of the overarm, use the blade parallel with the arm and grip it with the setscrews on the sides of the chuck. Turn the blade to cut sideways, and grip it with the setscrews at the front and rear of the chuck when cutting long boards that would hit the overarm column.

Grip the shanks of machine files in the lower chuck. Raise the hold-down foot out of the way and lock it.

If the tool vibrates in use, cut one or two coils off the overarm spring or use a softer spring.

It's a Jig Saw!

It's a Router!

It's a Shaper!

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Amazing new 3-in-1 tool!

Now! See and try the revolutionary *quality* tool that puts dozens of new skills at your fingertips – Porter-Cable's sensational new Routo-Jig! *Three most-wanted tools in one!*

Use Routo-Jig as a portable router, for mortising, grooving, rabbeting. Use it as a rotary jig saw–cut intricate contours and freehand shapes. Use it as a shaper, for accurate moulding, beading, joining.

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Special introductory offer! Model 140 Routo-Jig, complete with Router Base, Jig Saw Base, and Shaper Table–

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Yes, send me a complete catalog sheet on the Model 140 Routo-Jig, and the name of my nearest dealer.

Name_____

Address_____

City_____ Zone____ State_____

[*Continued from page 168*]

from the old Ford's transmission as it lay there. He got a scoop of sawdust to cover up the spot.

"Yeah," he said finally, "and neither did I. The trouble is, it wasn't a first-class job of repair. Barnstable's clutch was bad enough for any normal driver to want to have it rebuilt. But it wasn't bad enough for Barnstable to have wanted it rebuilt. I'm not so sure the clutch was causing his shift shudder and chatter after all."

"You don't tell me!" a beauteous expression of mirth came to Stan's face. "Is this good—the old coot paid for a job that, if he'd known it, he might have been happy to go without."

"Maybe," Gus said thoughtfully. "That's just where the shoe may pinch. What's going to happen if his car shudders and chatters when it shifts the same as it did before? Sounded like it would when he drove out."

"Crimminy!" Stan breathed. "Sure as shooting, the ring-tailed character will come back in here like a mad dog with a tin can on its tail."

Gus shrugged helplessly.

"I tried to tell him," he said grimly. "I wanted to check the car out—but he was so darned suspicious. Golly, here he comes now."

BARNSTABLE drove into the Model Garage, brought the Ford to a shuddering halt, leaped out like a spindle-shanked rooster.

"You gypped me!" he yelled. "It's worse than it was."

"Not worse," Gus said placidly. "You got a new clutch—remember."

"I'll sue you," Barnstable threatened.

"What for?" Gus queried, leaning calmly against the bench and lighting his pipe. "You got what you insisted on having, didn't you?"

"That's right, Silas," Stan agreed.

Gus and Stan could see the awful truth now dawning on Barnstable's face—he had guessed wrong, forced Gus to follow his guess and, worse yet, put out money without curing his trouble.

"Do you mean to tell me," he began weakly, "that I . . . ?"

"No," Gus said, anticipating his words, "I don't. I shouldn't do it, but if you'll quit being so suspicious, and give me a free hand, I'll try to fix you up without any further charge. . . . Where did you get the grease that you have in your transmission?"

"What business is that of yours?" Barnstable sputtered.

STAN HICKS cut in. "He got it," he said sharply, "from Robler, when he drained the summer grease from his trucks—Robler told me so himself."

"And," Barnstable said triumphantly, "Robler didn't charge me anything for it, either. You can still get a bargain at some of the garages in this town."

"Ah!" Gus grunted. "So that's it. That grease would be far too heavy for the transmission of your light car, Silas. It could be the thing that's causing your shift shudder and chatter."

"You knew it all the time," Barnstable accused.

"I didn't," Gus told him, "and I don't know it for sure now. I only suspected it after you drove out when I noticed some of your transmission grease on the floor.

"Ordinarily such heavy grease might not cause a car to chatter when being shifted, if the car was in good condition otherwise. But with a hundred thousand miles of wear on transmission gears, universal joint and drive bushings, it could be the cause of it.

"Let's see, Stan, drain and flush Silas's transmission and fill it with the proper grease."

When this job was done, a much-chastened Barnstable permitted Gus to road-test the Ford. The shift shudder and chatter were largely gone.

"Maybe," Stan Hicks told Gus later, "this will teach the old coot a lesson."

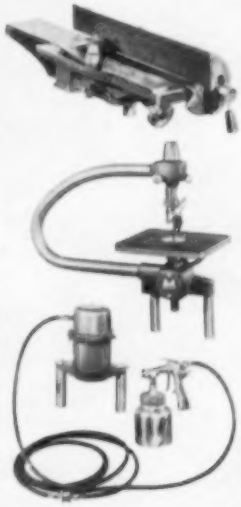
"I doubt it," Gus said. "Hang it all, if a man doesn't trust his mechanic, he'd best hunt up one he does trust." END

NEXT MONTH: Gus plays a double role.

Power-Mount — GIVES YOU 5 MORE REASONS FOR WANTING SHOPSMITH!

Power-Mount is the exclusive SHOPSMITH® feature that lets you take advantage of SHOPSMITH'S ¾-hp. motor and Speed-Dial to operate other tools.

Two auxiliary spindles drive jointer, jigsaw, sprayer. Each of the tools is mounted on your SHOPSMITH with twin-tubes.



1. **Power-Mount** saves you money by eliminating need for extra stands, motors, pulleys, etc.
2. **Power-Mount** saves you space —simply store tools "on-the-wall" when not in use on SHOPSMITH.
3. **Power-Mount** lets you add the rugged 4" MAGNA Jointer for use with SHOPSMITH for simultaneous saw-jointing.
4. **Power-Mount** lets you add the big 18" MAGNA Jigsaw for use alone . . . or with SHOPSMITH for jigsaw-disc (or drum) sanding operations.
5. **Power-Mount** lets you add the versatile new MAGNA Paint Sprayer for painting or staining projects that you build on your SHOPSMITH.

There are many *more* reasons why you'll want SHOPSMITH in your workshop. See and try this versatile power workshop at your leading hardware or department store or any Montgomery Ward store. It's yours for as little as $3 a week.

MAIL COUPON FOR 3 FREE BOOKS

1. "Project Digest." 36 pages of modern woodworking projects.
2. The valuable home-shop guide: "What to Look for When You Buy Power Tools."
3. Illustrated 20-page SHOPSMITH catalog.

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Please send me 3 free books.

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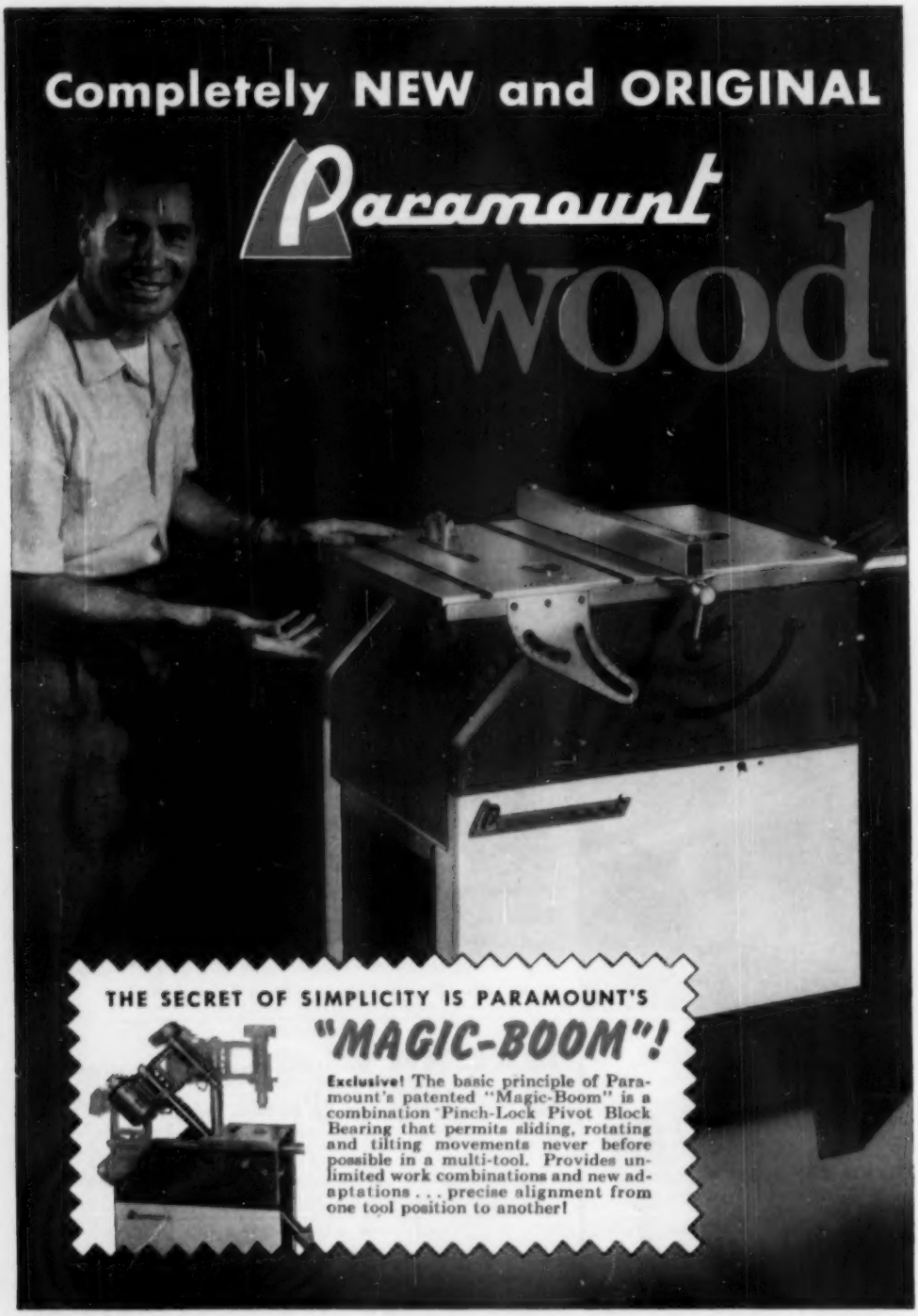
If you already own SHOPSMITH, check whether you have SHOPSMITH Mark 5 ☐, or SHOPSMITH Model 10 ER ☐.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"MAGIC-BOOM"!
Exclusive! The basic principle of Paramount's patented "Magic-Boom" is a combination Pinch-Lock Pivot Block Bearing that permits sliding, rotating and tilting movements never before possible in a multi-tool. Provides unlimited work combinations and new adaptations . . . precise alignment from one tool position to another!

MULTI-PURPOSE TOOL . .

worker

Compact! Rugged! Simple to operate!

Does all complex woodworking jobs quickly and safely! Simplicity of design eliminates mechanical troubles!

If you ever thought multi-tools were complicated to handle, confusing to operate, or troublesome to maintain—*get ready to change your mind!* A new engineering idea has made possible the greatest advancement in home workshop history. Not until now has there been a multi-purpose power tool so simple and compact in design—so easy to operate—so rugged in construction—so trouble-free in performance.

Compact—Only 2 feet square! Versatile—Unlimited work combinations! Portable—Take it from job to job! Precision—To industrial standards!

If you are interested in a home workshop, or are considering the purchase of a power tool, you owe it to yourself to see the new Paramount Woodworker. The purchase of a home workshop tool is an investment for a lifetime of power tool satisfaction and trouble-free service. Shop every multi-tool on the market. Compare them one against the other. There is no better way to prove to yourself the value and advantages of owning a new Paramount Woodworker!

Get the facts! Mail the coupon below for immediate information and name of your nearest dealer. See and operate the new Paramount Woodworker—examine the features that make it the most revolutionary multi-tool on the market. Once you do, you'll never be satisfied with any other power tool!

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Standard cut-off saw and self-retracting push-up saw. Correct speed automatically fixed.

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Tilting, sliding and rotating feature for set-up flexibility.

A HORIZONTAL DRILL!

No limit to length of work. Finger-tip micro-adjustment for accurate set-ups.

A DRILL PRESS!

A 360° radial drill press. Precision control raises and lowers head without strain.

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Largest sanding table in home workshop field. Engineered drive insures correct speed.

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with motor and attachments, ready to plug in.

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Please send me complete information about the new Paramount Woodworker and the name of my nearest dealer.

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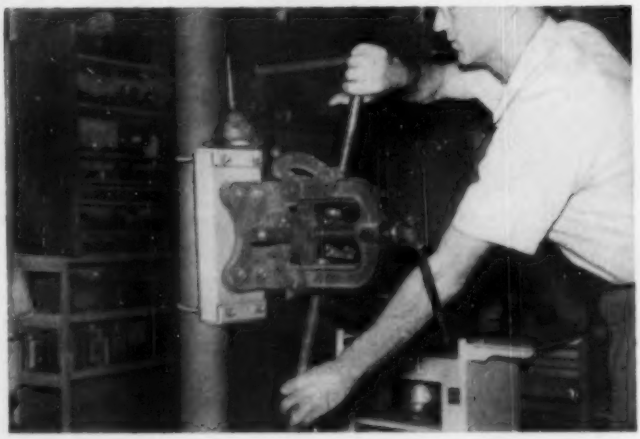
Pipe Vise Mounted on Column Provides Extra Clearance



THIS homemade column clamp puts my pipe vise where I can get at it from either side. When I need extra space for long stock I can swing it around 90°.

I bolted the vise to a wood base, and U-bolted this to a steel column. The U bolts are iron rods threaded at the ends. Strips of angle iron at top and bottom serve as washers and keep the wood from splitting.—*Adolph Sprenzel, Chicago.*

Rubber Pads Silence Jigsaw

VIBRATOR-POWERED jigsaws may jig and vibrate too much for the neighbors' comfort or your own. If yours does, slip a sponge-rubber powder puff—or a section cut from a kneeling pad—under each foot of the saw. —*Frank A. Javor, North Bergen, N. J.*

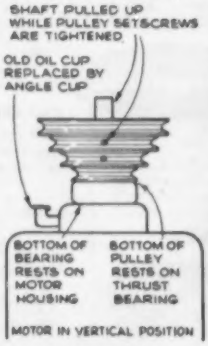
Spring Makes Snakelike Magnet

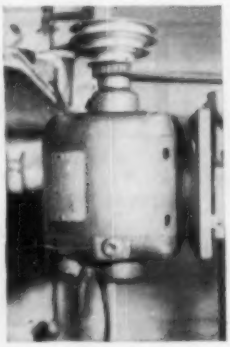
YOU can fish metal objects out of odd crannies with this gooseneck retriever. To make it, whittle down the wood handle of a small bulletin-board magnet and force-fit it snugly into one end of a screen-door or a similar type of flexible spring.

Thrust Bearing Under Pulley Takes End Load, Saves Motor

WHEN it is necessary to use a motor with sleeve bearings in a vertical position, as on a drill press, support the weight of the armature shaft by a thrust bearing between the motor housing and the pulley.

File the housing end flat, and slip the bearing and pulley on the motor shaft. Then tighten the pulley setscrews while pulling upward on the shaft to relieve pressure on the bottom end. If the motor is a brush type, be sure to see that the brushes are centered on the commutator before tightening the pulley against the thrust bearing.—*H. Landauer, Tampa, Fla.*





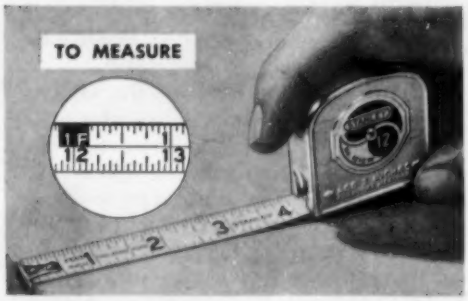
The Right STANLEY Tool

The rugged little work horse of the workshop in 90% of your woodworking jobs. Versatile, light weight and high speed, its motor is used to power the plane shown. *H15 Router — $39.95.*

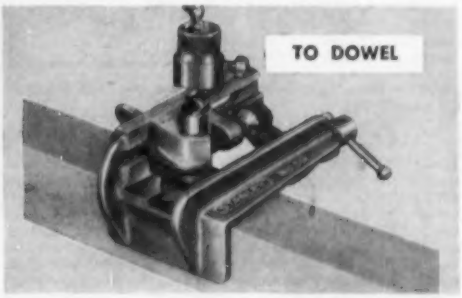
This tool is a wonder for smooth and easy planing. Just right for fitting storm and screen doors and windows, trimming wood, plastic or aluminum veneers on table and counter tops. When you have H15 Router, Kit is all you need to convert to power plane. *H106 Plane Adapter Kit — $30.50.*

New! Router-Plane Kit

Combines H15 and H106 with gauge and bit in handy fitted carrying case. *H100 — $89.95.*



144 inches of easy reading, easy-to-use, measuring accuracy in a compact 2 inch case. A full 12 ft. blade with *convenient* scales in both inches and feet and continuous inches, as shown. Rule comes in smart, useful plastic box with magnifying lens. Be precise . . . say Stanley. It's a *good* rule. *No. 1212W — $1.89.* Also available in 6, 8 and 10 ft. lengths *— 98¢ to $1.49.*



Joining two pieces of wood together is one of the first jobs a woodworker masters . . . and it isn't really *mastered* until you do it with dowels. Here's a jig from the Toolbox of the World that makes good doweling easy. With it you can bore holes accurately in edge, end or surface of wood. 6 guides for 3/16 to 1/2 inch bits and depth gauge furnished. No. 59 Doweling Jig — *$6.50.*

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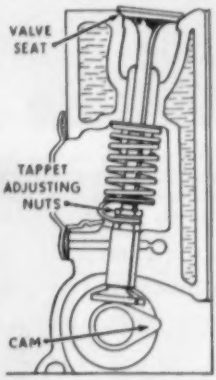
Care and Feeding of Engines

BY S. P CORP

VALVE ADJUSTMENT

Before you start to adjust valves, consult manufacturer's specifications and know the answers to these questions: 1. Should your valves be set hot or cold? 2. What are the intake valve tappet clearances? 3. What are the exhaust valve tappet clearances?

Tappet clearances *below* specifications will make camshaft open valves too early and close them late, which can cause exhaust valve burning. NEVER REDUCE VALVE TAPPET CLEARANCE TO ELIMINATE NOISE. Instead, look for worn tappets or misalignment of valves in the guides.



Tappet clearances *above* specifications cause camshaft to open intake valve late and close too early, reducing amount of fuel entering cylinder, and losing power. The same condition in exhaust valves imposes an extra load on connecting rod bearings. Always follow specifications!

NOTE: These facts do not apply to valves with hydraulic valve lifters.

LOCATING A MYSTERIOUS MISS

If a cylinder misses, look for corrosion in the distributor cap. Pull each wire out of the cap and clean sockets with a wire brush. If corrosion has eaten away the metal, or terminals are eroded, get a new cap. Also check to see that carbon brush is not chipped or broken. Inspect rotor for cracks or oxidation at the tip. If tip is burned, the resulting gap could cause that mysterious miss. In such a case, you need a new cap and a new rotor.

GET THIS FREE MANUAL

Send a postal card request for your free copy of "Care and Feeding of Engines," the new illustrated manual of car care. It contains helpful hints on everything from Air Cleaners to Windshield Wipers. When you re-ring, use Sealed Power KromeX Ring Sets for fast break-in, immediate oil control, and double ring life. Solid chrome faces on top compression ring and oil ring side rails fight heat, friction, corrosion. Sealed Power, Dept. H-11, Muskegon, Michigan.

Sealed Power

PISTON RINGS

Biggest Airlift

[*Continued from page 152*]

destination—Ashiya Air Force Base on Japan's island of Kyushu. One of the amazing things to me was that our big plane's wheels touched down on the runway at Ashiya within minutes of our scheduled time of arrival. I found out later that no plane out of the 43 that formed the actual air bridge was more than one hour late! Quite a record for a 9,000 mile flight, mostly over water.

As each Globemaster landed, the Red Devils of the 508th were transported by rail to the three camps—Kashii, Chickamauga and Wood—that will be their bases during their tour of duty.

Within 60 hours after the first Globemaster had landed at Ashiya it had been checked and serviced and was taking on a load of the 187th's Angels from Hell

A brilliant man is one who is shrewd enough to recognize you're a genius.
—THE SIDEWALK SUPERINTENDENT

at Itazuke Air Force Base for the island-hopping trip back to the States.

On the average, each of the Globemasters used in the actual transfer mission was away from its home field in the eastern U.S. no more than 166 hours.

The secret of the joint Army and Air Force part of Operation Gyroscope (code name for the Army's world-wide program of troop rotation) was, as always, detailed preparation. Two weeks before the first Globemaster took off with its load of men from Fort Campbell, Ky., maintenance crews, spare engines and parts, and spare Globemasters were flown to Travis, Hawaii, Wake and Japan. Close to 1,000 men of the 63rd Troop Carrier Wing of the 18th Air Force manned and serviced the planes along the route.

To the Army and Air Force, the airlift of the Devils and the Angels was just another peacetime tactical problem. According to Major General Chester E. McCarty, commander of the 18th Air Force, it would be just as routine, given the needed planes, to move any number of men to any point in the world. END

A 30 h.p. Alternate Four, weighing only 110 lbs.... the exclusive Mercury carrying handles actually make it seem lighter... available with 12-volt electric starter and generator... all the quality Mercury features.

Proved by years of brutal field testing, backed by experience only Mercury has from building more than two million horsepower of famous 4 cylinder Thunderbolt engines! The finest, smoothest, most powerful engine in its class... fully qualified to wear the Mercury trade mark.

6½ gal. remote fuel tank standard equipment

MERCURY ... *THE MOST POWERFUL NAME IN OUTBOARDS*

REMEMBER ... *A FOUR IS BOUND TO BE BETTER*

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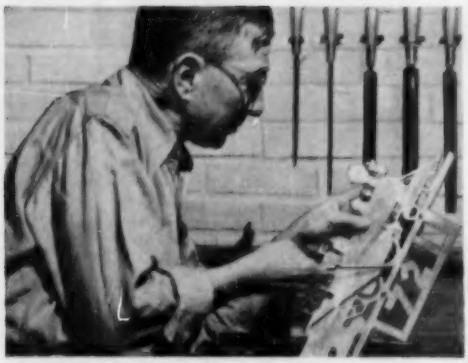
HOW TO GET THE MOST OUT OF FILES



You do better work and your files last longer when you follow these few simple rules

1. CHOOSE THE RIGHT FILE FOR THE JOB. Nicholson triangular Slim Taper, and Mill, Flat, Half Round, Round and Square Bastard files fill basic workshop needs. For coarser or finer filing, or work on special materials, there are Nicholson files especially for the job.

2. USE FILES CORRECTLY. Each kind of filing—straight, draw or lathe—has its own file grip and motion. Holding the file at exactly the desired angle is important. Work height is important, too: elbow height normally, lower for heavy filing, near eye level for precise work.

3. TAKE CARE OF FILES. Protect precisely-formed teeth by standing your Nicholson files in a rack or hanging them by their handles. *Never* throw them in with other tools or stack them. Clean often with a Nicholson File Card or Brush. A soft iron "scorer" helps remove stubborn pinnings. Chalk removes oils or grease.

At good hardware stores everywhere

Experienced craftsmen choose Nicholson files for uniform high quality and long work life.

Write for free 50-page file "textbook." ***"File Filosophy"*** tells you more about how to choose, use and care for files.

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NICHOLSON FILES ***FOR EVERY PURPOSE***

Mexican Road Lures Do-It-Yourselfers
[*Continued from page 160*]

selves; they couldn't break, didn't rattle.

Work gloves to save washing hands so often that the skin might crack in the dry climate.

Bags—plastic and paper, including waterproof, for wet things and to protect pans and packages from abrasion.

The kids! This was a trip they really enjoyed. It taught them a lot. Generally speaking, Mexicans seem to be fond of children. We were welcomed most heartily and felt we were given rather special treatment because we had them along.

Not so handy. We encumbered ourselves with a certain amount of junk we'd have been happier without—things like these:

Good luggage. It was hard to pack and got badly beaten up. Flexible zipper cases and surplus duffel bags were better.

If you are in doubt as to whether or not your house needs redecorating, the children will usually do all they can to help you decide.
—THE SIDEWALK SUPERINTENDENT

Jeep can for extra water. It turned out to be a nuisance that delivered only rusty water. A water bag is better.

Hats for streetwear are not necessary. Women usually wear scarves in Mexico, men can always pick up cheap sombreros if they need protection from the sun.

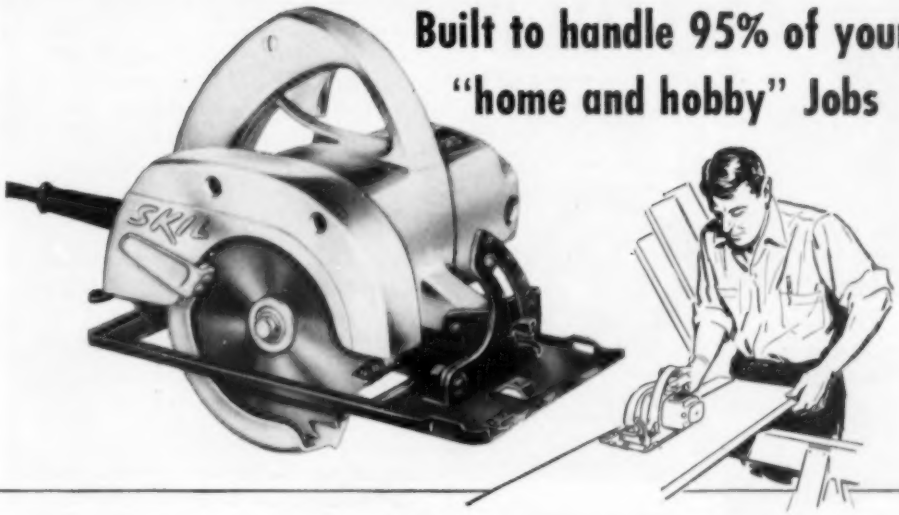
Extra clothing of any kind took more room than it was worth. Stick to synthetics and wash them out each night if necessary. They'll be dry by morning.

But don't go too well prepared. If we'd taken perfectly good advice and set out with all new tires, we'd have missed the fun of shopping for a new one in a Sears, Roebuck just a few rods from the only catacombs this side of Rome.

That, incidentally, was where we got our front wheels aligned not once but twice within an hour: I couldn't find the Spanish to tell the mechanic that his buddy, now invisible, had already done the job the ticket called for. END

NOW! A Genuine SKIL Saw for only $29.95

Built to handle 95% of your "home and hobby" Jobs



Here's all the power and performance you need for almost any home or workshop sawing job—at a fraction of the price you'd pay for a heavier saw! This quality SKIL saw has ample capacity to speed through paneling, plywood, tongue-and-groove board and shelving. Makes quick work of Celotex, wall board, Formica and other materials. Cuts 2 by 4's simply by flipping the board. Lightweight comfort-grip handle for easy one-hand operation. Cuts to 1-5/32" vertical depth, makes 45° bevel cuts to 1" depth. This is a "must" for every home. Ask for a demonstration at your Hardware Dealer's today!

No Other Saw Offers these Famous SKIL Features for Only $29.95!

• Powerpacked motor • Guard lift-depth and bevel adjustments • Trigger-type switch • Built-in sawdust blower • Telescoping blade guard • Comfort-grip handle

4¼" SKIL SAW, Model 504

does these and many more sawing jobs! Build screens, storms, sashes! Build cabinets or built-ins! Build a spare room in attic or basement!

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BUILDERS TOOLS

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5033 Elston Ave., Chicago 30, Illinois
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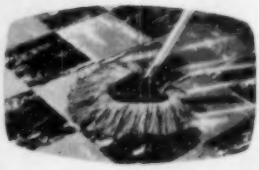
Factory Branches in ALL Leading Cities

Win a Ford Victoria—or One of Many Other Valuable FREE Prizes!

It's easy to win—there's nothing to buy! Enter the big SKIL Grand Prize Contest! Entry blanks at your Hardware Dealer's!

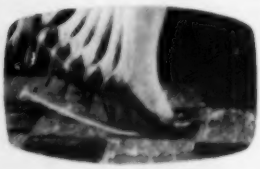
B.F.Goodrich
Koroseal
FLOOR TILE

INSTALL IT YOURSELF!

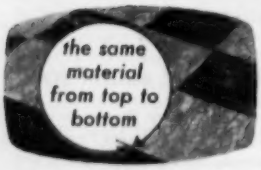


Needs No Extra Surface Finishes

Defies Destruction



Anti-Slip Surface



Gives Maximum Wear

It's ideal for any floor, no matter where!

B. F. GOODRICH CO.
Dept. PS10, Flooring Division
Watertown 72, Mass.

Please send FREE color chart on B. F. Goodrich Koroseal Floor Tile.

Name.....

Street.....

City.....*State*.....

Giant Glider to Climb 13 Miles
[*Continued from page 108*]

feet—a world's record altitude—in the tremendous lee wave east of the Sierra Nevada mountains in California. The pilot who set this mark, Laurence E. Edgar, 38-year-old senior flight-test engineer for Goodyear Aircraft, later figured in another incident that demonstrates the treacherous dangers lurking in these powerful air currents.

He was descending from 40,000 feet when his glider fell to pieces around him. Here is how he describes it:

"***I flew into a blast of wind,*** at about 15,000 feet, that smacked me with the sound of a car hitting a truck at high speed. I was torn out of my safety harness and thrown through the canopy of the cockpit.

> ***Anyone can become wealthy in America by inventing something useful that doesn't last long—like home permanents.***
>
> —THE SIDEWALK SUPERINTENDENT

"I fumbled across my chest for the rip-cord of my parachute and yanked. It opened immediately and soon I was turning and swinging quite violently. Every so often I would be yanked upward in the turbulent air.

"I came out of the turbulence just below the main roll cloud, a massive, dark, boiling thing. I didn't want to get carried up into it again. I pulled on the shrouds at one side to collapse the chute partially so I could get down to a safe level quickly. I could see parts of the sailplane being carried up past me and disappearing into the cloud."

The wild turbulence that disintegrated Larry Edgar's beefed-up glider—one of the most rugged flying machines ever built—gave vivid proof that the full extent of the wiles and strength of a lee wave are still not known.

Scientists are continuing to probe its secrets—to protect ordinary aircraft from its dangers and to tame its power for exploration of our space frontier. END

NOW! Professional quality in a new line of home power tools!

See the difference? From the rugged extra-heavy steel castings, to the precision-ground mirror-polished working surfaces, Toro power tools give you a new standard of quality in home workshop power equipment.

Look at that 10-inch tilt-arbor saw! The single, massive, out-in-front control either tilts, or raises and lowers the blade. And check these other "out-in-front" Toro features: the integral casting of rip-fence track and table . . . the smooth-sliding rip fence that locks solidly in place, front and back, with quick lever-action.

No wonder the new Toro power tools are so accurate! They're backed by 40 years' experience in building precision power equipment—including the world's most complete line of power mowers.

See this professional quality line of Toro power tools at your dealer's *soon*—or mail coupon below for a deluxe full-color catalog.

** Table extensions and stand optional.*

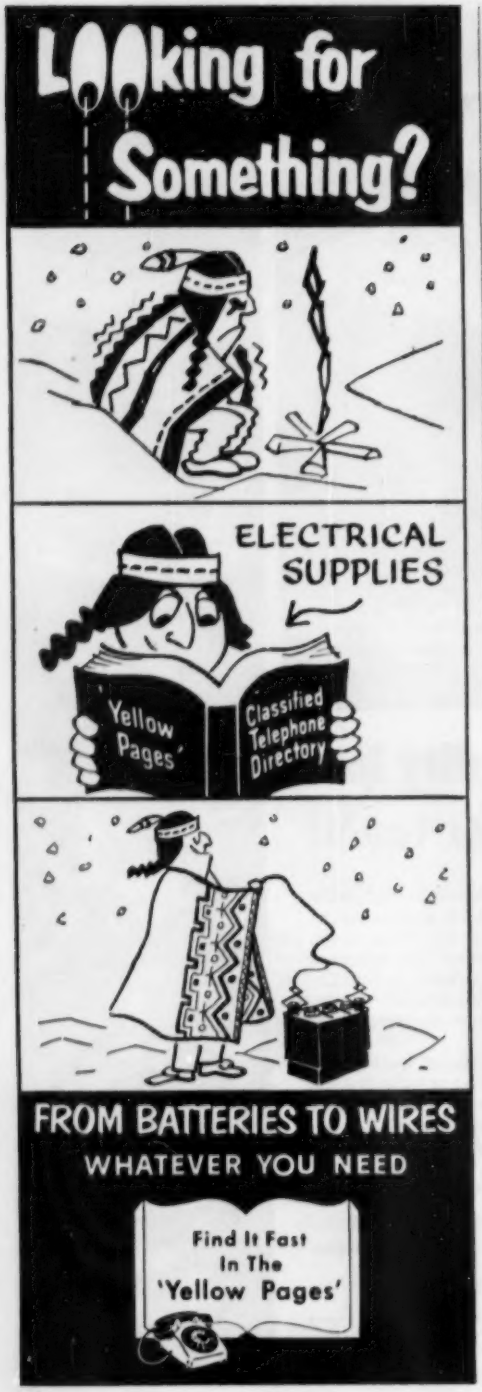
TORO MANUFACTURING CORP. Minneapolis 6, Minn., Dept. 115

YES! I'd like a free copy of the deluxe Toro power tools catalog!

NAME.....

ADDRESS.....

CITY.....ZONE...STATE.....



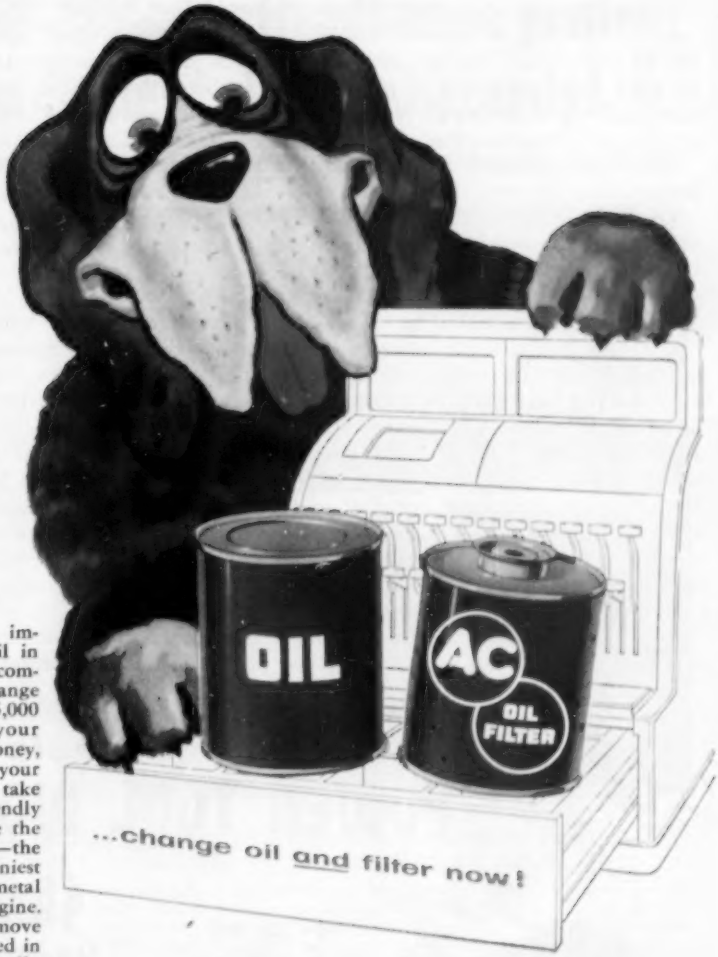
Dolly Saves GI's Aching Back

It's light, it's convenient, it's a duffel-bag hand truck; and its builder, Sgt. George M. Harmon of Levittown, N. Y., thinks that every GI should have one. He built the simple two-wheel cart after 13½ years' service and half a dozen trips overseas, and now he's the envy of every aching back in his outfit.

Log Brander Colors Its Tracks

Every time inventor Jack Jamieson swings his strange hammer against the rim of that log butt, he leaves a colored cougar track with an indented symbol in its center. It makes logs easier to identify, and helps foil log rustlers. Paint squeezes from a handle reservoir and spits out through several tiny jets on impact.

Don't forget your change!



Mighty well-trained dog!

Trained to register *two* important things! Change oil in your car at factory-recommended intervals—*and*—change your AC Oil Filter every 5,000 miles! If you forget your change you'll be "out" money, important money should your engine be damaged. So, take the AC Sludgehound's friendly tip. Change filter. Be sure the filter change is to an AC—the filter that takes out every tiniest particle of grit, dirt, dust, metal—to really protect your engine. An AC Oil Filter won't remove the valuable detergents used in today's heavy-duty engine oils.

Ask for the best—AC.

AC OIL FILTERS

Watch BIG TOWN NBC-TV

GM GENERAL MOTORS

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION • FLINT, MICHIGAN

THE ONLY FACTORY-APPROVED FILTER FOR CADILLAC • BUICK • OLDSMOBILE • PONTIAC • CHEVROLET • GMC

Hydra-Matic Dampens That Thump

[Continued from page 121]

tle. To mend that, Pontiac and Cadillac in 1955 have provided a part-throttle downshift up to 28 m.p.h. Now you can get that part-throttle spurt up to 35 m.p.h.

The forthcoming Oldsmobile will, of course, have the new transmission too.

Other changes in the 1956 Cadillacs and Pontiacs are substantial. The regular Caddy is pegged at 285 hp., up 35, and the fancy pants Eldorado at 305, up 35. Compression is hiked to 9.75-to-1.

Cadillac boosted its horsepower by making numerous modifications in its engines. The bore is up to four inches, a boost of 1/5 inch, and the stroke to 3 13/16, up about 3/16. The displacement is boosted from 331 cubic inches to 365. High-lift cams have been installed, and a spring has been added under the little check valve on the automatic lash compensators to mend "float" above 4,500 r.p.m.—allowing a thousand more revs.

Axle ratios continue to drop. At 3.36:1 in 1955, Caddy's is at 3.07:1 for '56. And, important to the feel of that wheel, the over-all power-steering ratio is changed from 21.3:1 to 19.2:1.

Caddy also introduced a high-priced hardtop coupe, the Seville—apparently meant to compete with the Ford Motor Co.'s Bar Harbor Continental.

The reason the way of the transgressor is so hard is the traffic on it is so heavy.
—THE SIDEWALK SUPERINTENDENT

Pontiac, too, has something new in body shells, a four-door hardtop. Its engine displacement is now at 316.6 cubic inches, up from 287. Horsepowers, of course, are up here too. The top Star Chief series boasts 227, up a whole 47 horses. You can get a modest 205 horsepower in Pontiac's 870 and 860 series, and the bigger engine is optional.

But, for driving pleasure, it's that 1956 Hydra-Matic transmission that makes all the difference. END

Good News for budget-minded HANDYMEN...

now buy this basic

POWER TOOL WORKSHOP

for only

$17.50 DOWN

and small monthly payments

IT'S THE NEW

Shopmaster

SAW-JOINTER COMBINATION

Now you can buy Shopmaster tools on the famous GECC Handyman payment plan. Pay only 10% down and balance in up to 18 months. Buy the Shopmaster Saw-Jointer combination or any Shopmaster tools totaling more than $150 on this wonderful handyman payment plan. It's Shopmaster's way to give you tomorrow's power tools right now!

GENERAL ELECTRIC GECC CREDIT CORPORATION

Look at these saw-jointer features

- Ready to plug in
- Handy switch in front
- Complete with ½ HP motor
- 8" saw with 2½" depth, 13"x16" table size, mitre gauge and rip fence
- 4" jointer-planer with ⅛" cut, 4"x26" table and flexible guard
- All steel stand 26"x34" and 36" high
- Sealed-for-life ball bearings
- Complete only $174.50

It's America's Greatest Power Tool Value!!

WRITE FOR FREE CATALOG

Shopmaster

ROOM 11D, 1214 SO. THIRD ST., MINNEAPOLIS, MINN.

New G-E *All-Weather* Headlamps protect you from 3 night driving hazards!

Replace your present headlamps now! A pair costs so little

1. THEY HELP YOU SEE THROUGH FOG, RAIN, SNOW

The top photo at right was taken with ordinary headlamps. A man changing a tire a short distance ahead is practically invisible in the fog. The bottom picture shows the identical scene, this time with General Electric *All-Weather* Headlamps. Now the man changing a tire is clearly seen *through* the fog—and in time to stop.

G-E *All-Weather* Headlamps help you see through fog, rain and snow far better than ordinary headlamps. The uncontrolled upward light from ordinary headlamps reflects off the fog and back into the driver's eyes, as blinding "kick-back" glare. But G-E *All-Weather* Headlamps have a specially designed shield over the lower beam filament. It blocks out the uncontrolled upward light making it easier to see in fog, rain and snow, with little or no interference from kick-back glare.

2. THEY MAKE IT EASIER TO SEE THE ROAD AGAINST ONCOMING HEADLAMPS

Photo at left below shows how you see against oncoming headlamps when your car has ordinary headlamps. 50 feet beyond the oncoming car, a pedestrian can barely be seen. In photo at right, your car now has G-E *All-Weather* Headlamps. The pedestrian is now clearly visible. Your seeing distance along the right-hand curb is increased by as much as 80 feet.

3. THEY PUT LIGHT FAR DOWN THE ROAD TO LET YOU SEE CURVES, DIPS AND OBSTACLES

General Electric *All-Weather* Headlamps are more powerful than ordinary headlamps. The 6-volt size, for instance, gives 25% more light! Since the fog shield does *not* cover the upper-beam filament, you get maximum light for distant seeing in clear weather. The extra light is spread over a wide area, including the shoulders of the road, to show curves and obstacles while they're still far away.

REPLACE PRESENT HEADLAMPS NOW—G-E *All-Weather* HEADLAMPS FIT YOUR CAR

Don't wait until your present headlamps burn out. Put General Electric *All-Weather* Headlamps on your car today! Miniature Lamp Dept., General Electric, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

"This stuff can MURDER your car engine!"

—says Fonty Flock
ace stock car driver

Destructive grit and sludge can run up big repair bills—if your oil filter is clogged

Your oil filter traps so much road dust, hard carbon and metal filings in about 4000 miles that it becomes clogged. Naturally, a clogged filter can't protect your engine. You need a new Purolator® Oil Filter! Up to 10 times more effective than ordinary filters, Purolator keeps your engine running cleaner, smoother, *longer*. Ask your serviceman to install a new Purolator Micronic® Refill *every 4000 miles*. Takes only minutes. From $1.60.

© 1955, Purolator Products, Inc., Rahway, N. J.; Toronto, Canada

9 out of 10 NASCAR racing drivers use

PurOlator

America's No.1 Oil Filter

Plastic Booth Cuts Shop Noise

THE clatter and screech of heavy machinery won't compete with telephone conversations when extensions are tucked inside this Celanese-plastic sound shield. The sound-absorbing booth reduces noise level in a busy shop location to that of an average office, says its maker, Design Craft Limited, Toronto.

Roll Doors Speed Truck Loading

FLEXIBLE side panels that roll up and down like windows put all the cargo space in this truck within sight and reach. The Timmons Metal Products Co., Columbus, Ohio, uses glass-fiber sheets for the doors. The lightweight panels move in guide rails, need no lifting mechanism, and won't chip, dent, break or warp.

Get the battery with the

GIANT PLATES

Giant plates of pure virgin lead and lead peroxide provide more than 2,000 square inches of plate area . . . one of the many, many reasons why a Genuine Ford Battery is right for your Ford.

Genuine Ford "Power Punch" Batteries have extra big plates to give you greater power and longer life

Now's the time to make sure for the cold months ahead, your Ford is ready to give you all the ready-to-go performance that was originally built into it.

A simple check by your dealer will tell if a new battery is advisable. If necessary, he can supply the Genuine Ford "Power Punch" battery with exactly the *right* capacity for your Ford's electrical system. Ford "Power Punch" batteries, like all Genuine Ford Parts, must pass exhaustive tests by the men who originally built your Ford before being approved for manufacture.

Remember, whenever replacements will add to your Ford's "go," always insist on Genuine Ford Parts—they're made right, to fit right, to last longer.

Keep your Ford all Ford

Continental Unveils a Royal Coach
[*Continued from page 125*]

steering, transmission, seat, windows and those vent panes. A manual synchromesh box can be had as custom equipment for those who insist on being difficult. Instrumentation is all by waggling pointers, none by chinchy warning lights, and the gauges all have a splendid Swiss look to them. Hanging over the transmission hump, trimly crafted in dull gold, are a set of handles to adjust the climate within Mark II to suit your whim.

At this point it is necessary to pause, especially if you are a budgeted man. For tabbed to the carpeting on the hump, gleaming in gold, is a small metal plate engraved: "Built Expressly For . . ." You provide the name.

For a taste of Mark II in motion, light up the 285-plus-horsepower V-8. You can verify that it's running by glancing at the tach or oil-pressure gauge. Seat not just right? Finger the buttons and you not only ease 4½ inches to or fro and up or down, but also tilt forward or back an inch or two.

Comfy? Then toe down the torque converter to LO, skim away, and don't clock the acceleration. All you'd find out is that the car is fast, and that you are a boor. Driving or even riding in Mark II might well be described as a great, wide, wonderful whirl. Each passenger, nestled in a body-molded seat and with his feet down in a private floor well, is cradled in his own cockpit. The ride, though exceedingly soft, is not spongy or loose. This 5,000-pound car handles unexpectedly well, perhaps because of the low, low CG and the tight 22:1 steering.

Underlying principle. Up front the Lincoln-built OHV engine has enough jazz to urge Mark II very nearly as fast as the fastest. Nearly but not quite: Continental owners are not the sort to worry about maintaining their rank in the hot-mill community. The underlying principle around the Continental plant is to build it as well as possible, with all the performance good sense dictates, in a style good taste will appreciate for

[*Continued on page 266*]

$239 delivered (saw blade and ¾ hp. motor included). EASY BUDGET TERMS

New 1956 AMF De Walt "Power Shop" makes all home woodworking easy!

Here, in one big-capacity machine, is a complete home workshop . . . that gives you . . .

- The *power* you need for any operation
- 3-D versatility to handle any home project
- The *professional accuracy* to do any job quickly, easily, *expertly*
- The built-in *safety* you *want* in your home

See a demonstration of the new 1956 AMF De Walt Power Shop at your dealer's today. Now more than ever, it's the finest, safest, most complete home workshop you can buy.

New ¾ hp. direct-drive, custom-built motor. Rugged, reserve power for the toughest jobs — staying power for steady use.

Easy, safe, top-side cutting. Always see your mark and your cut — never work "blind." Saw moves above the work.

Straight-line material handling. Arm swings 360° Motor rotates 360°—tilts past 90°. Material always moves straight on level table.

No floor space needed. Built into work bench, arm swings clear of work area . . . swings back when needed.

Exclusive New Shaper-Jointer Fence. Converts saw to a 2" jointer at 1/3rd the cost. Positions work for accuracy, safety.

Exclusive New Shaper Guard. A De Walt "First" safety accessory. Totally encloses knives and spindle — raises for adjusting work.

Another AMF Product

DE WALT POWER TOOLS

Complete versatility. Simply change tool on motor shaft. Your AMF De Walt saws, dadoes, shapes, sands, bores, routs, surfaces, joints. It buffs, grinds, turns, cuts curves . . . does *everything* in woodworking.

New safety. New safety key switch — one of many De Walt home safety features — turns power on or off. Take key with you and your family is completely protected.

SEND COUPON TODAY!

AMF De Walt, Dept. PS-55-11, Lancaster, Pa.
In Canada: De Walt Canada, Ltd., Guelph, Ontario

☐ Please send me Free Colorful 20-page Booklet on how to do everything in woodworking . . . *easily*.

☐ Please send me Free plans on how to build a home workbench.

Name _____

Address _____

City _____ Zone _____ State _____

Continental Unveils a Royal Coach

[Continued from page 264]

years. Mark III is not due until we're all some years older.

At first the silence of the car may spook you; with the windows up, there is no clamor from the peasantry outside, and very little sound beyond a faint hum of V-8 basso. Enough body insulation to paper a radio studio helps achieve this. Vibration has been damped out both on the drawing boards and on the hand-fitted assembly.

The pieces. A pause to look at the parts of America's most expensive auto tells a lot. As Continental engineer Matt Wyatt points out, Mark II's sheet metal is the heaviest in the industry. It positively refuses to bong; if you knee a side panel it refuses to pop but just leans reluctantly. Rap on the hood or deck lid and they sound like grand-piano lids.

The frame under this gold-dusted chariot looks at first like a war-surplus gun platform. It weighs a ponderous 535 pounds by itself, and is a rugged, ladderlike layout of box rails and tubular cross members. There's a box-member spine running down the center carrying the three-piece drive shaft strapped to its back. Up front is a sturdy box-and-tube cross member that might be something left over from an M-48 tank.

Every car built is road-tested on Continental's private track, run long enough so that the break-in oil can be drained and replaced, and then tuned to a sharp edge. The moment an owner takes delivery, he can set out for Patagonia at full throttle if he wants to. And if he ever needs to check on the car's idiosyncrasies, there is an envelope on file at the factory that tells everything about it from engine to paint job.

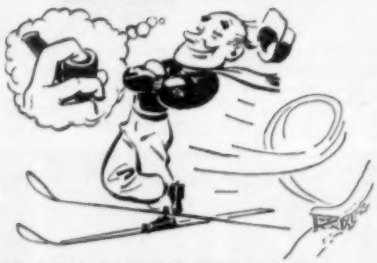
Unless Mark II's owner is a mechanical type, he may not even know about some of its hidden gimmicks. Such as the special steel spring hangers that are designed to prevent rump slew and to keep

[Continued on page 268]

IT SMELLS GRAND

WANT AROMA WITH "LIFT"? MAN, HERE'S HOW

IT PACKS RIGHT



AND IT PACKS SO NEAT IT RATES A BOW

IT SMOKES SWEET

IT'S THE PIPE-BLEND CHAMP YOU MUST ALLOW

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE.

FREE!

24-PAGE BOOKLET ON PIPE CARE. JUST WRITE TO: SIR WALTER RALEIGH DEPT. HS, LOUISVILLE, KY.

UTICA® Adjustable Wrenches

FOR THE BEST IN GOOD TURNS

LOOK FOR THE NAME UTICA®

No. 91

Yes, many, many good turns because they offer you a very special UTICA feature. The jaws surfaces are extra hardened by UTICA's own process of electronic induction. Jaws resist nicks and burrs, stay smooth and new-like up to 10 times longer than ordinary adjustable wrenches.

An adjustable wrench is a mighty handy tool, but be sure to look for the name UTICA on the handle. Sizes from 4" up to 18"

U TI CA

THE HALLMARK OF QUALITY

UTICA DROP FORGE & TOOL CORP.
UTICA 4, N. Y.

In Canada: Adlam Tool & Supply Co., Ltd., Montreal

ADD *YEARS* TO THE LIFE OF YOUR ROOF!

Stop Leaks!
Save Big Repair Bills
with **GLASSTITE®** Liquid
Glass Roof Coating

Easy Do-It-Yourself Job

FULL 12 YEAR GUARANTEE

Paint your roof NOW with Glasstite—and save hundreds of dollars in repairs through years to come. It's an easy do-it-yourself job. This new scientifically developed liquid glass coating provides a tough leathery surface on any type of roof. *Guaranteed* to remain water tight *at least* 12 years.

Glasstite is positively one of the best "life insurances" you can buy for any roof, new or old. Protects indefinitely against deterioration. INTRODUCTORY PRICE only $6.25 for a 5 gallon container of black Glasstite which effectively covers 200 square feet. Also available in aluminum at additional cost. We will ship, carrying charges collect, by most economical means. Order now. Send check or money order. Give your roof the penny's worth of prevention that saves many dollars in repair.

INQUIRIES FROM DEALERS INVITED

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Established in 1900 and Producing Quality Products for 55 Years

GIVE MEASURING TOOLS THIS CHRISTMAS....

YOU'LL FIND *LUFKIN* TOOLS

Will Fill Your Christmas List . . .
And Not Empty Your Pocketbook!

For The Home Handyman Or Lady-Of-The-House

WHITE CLAD MEZURALL TAPE RULE
6, 8, 10 and 12 ft. lengths. Snow white line, jet black figures, extra strong featherweight magnesium case.
98c to $1.89

For The Do-It-Yourselfer Or Home Craftsman

SUPER WHITE CLAD MEZURALL TAPE RULE
Wide ¾-inch line. 16-inch centers indicated. 10 and 12 ft. lengths. Extra strong featherweight case. Extra big self-adjusting end hook.
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WHITE CLAD BANNER LONG STEEL TAPE
25, 50, 75 and 100 ft. lengths. Snow white line with jet black markings. Attractive maroon vinyl covered case.
$3.50 to $6.50

ALL LUFKIN WHITE CLADS ARE PACKAGED IN ATTRACTIVE, REUSABLE PLASTIC CASES . . . MAKING IDEAL CHRISTMAS PACKAGES.

BUY *LUFKIN* TAPES • RULES • PRECISION TOOLS
FROM YOUR HARDWARE, LUMBER OR TOOL DEALER
THE LUFKIN RULE CO. • SAGINAW, MICH.

Hastings Oil Filter Cartridges keep oil clean from filter change to filter change* when replaced as normally recommended... The reason is DENSITE

Densite—an amazing new type of filtering material—is made of millions of selected raw cotton fibres, pressure packed so oil must flow through countless tiny openings, pass many surfaces of fibres. The most microscopic abrasives cling to these fibres—and stay there!

Next time you change oil—change your filter cartridge. Ask for Hastings and have clean motor oil *all the time!*

* As proven by tests conducted in accordance with U. S. Bureau of Standards procedure.

HASTINGS MANUFACTURING CO. • HASTINGS, MICH.

HASTINGS
OIL FILTER CARTRIDGES with DENSITE

[*Continued from page 266*]

out tar-strip thump-thumps. Or the new fancy-pants shock absorbers that have thermostats in them (to equalize ride during speed on a rough road when shocks run hot, and slowness on a smooth road when they run cool).

Another tony touch about Mark II is provided by the slatted wheel covers. These spray sunlight over the onlookers whenever the car moves. The first attempt had the hub, disk and spear spokes stamped out in one piece. The designers held their noses. So now each spoke is screwed on separately, and it takes almost as long to build a Continental wheel as to make a complete Ford.

This pinch-no-pennies philosophy doesn't mean that the Continental Division is off its fiscal rocker. The car is being made for two reasons, prestige and profit, and it is well known which of that pair fills the hamper at the A & P. The break-even production for a year of Mark IIs is reputedly 2,500 cars.

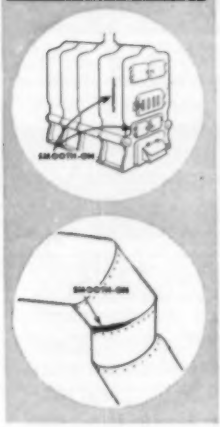
> ***Nothing arouses a woman's curiosity like a neatly tied package that her husband thinks he has hidden from her.***
> —THE SIDEWALK SUPERINTENDENT

The chi-chi market. The goal doesn't appear difficult. Months before the car was publicly unveiled, 1,200 definite orders, many with deposits, had arrived at the plant. This appears to confirm the theory that there are a substantial number of people around who have continuing difficulty in disposing of their money. Continental did not, however, content itself with theory. Preliminary decisions were taken only after a sharp scrutiny of such glittering straws in the wind as sales of yachts, fur coats, homes costing over $75,000, and world cruises.

Out of these statistical meditations, Continental has distilled a heady production estimate of 2,500 to 4,000 Mark IIs a year. Certainly a lot more people than that will long to see their names in the golden writing on the floor. END

STOP COSTLY HEATING

Leaks



Use Smooth-On No. 1, the IRON repair cement. It hardens like metal, fills cracks and holes in any casting, pipe, radiator, or fitting. Does the job by expanding inside the repair, gets stronger with age. Withstands water, steam, gas, fire, and smoke, stops wasteful drafts in conversion jobs.

FREE 48-Page Repair Handbook

gives details for these and dozens of other repairs. Written so you can "do it yourself." Get a copy at your own hardware store or drop us a card. Sent postpaid.

SMOOTH-ON MANUFACTURING COMPANY
Dept. 58, 572 Communipaw Avenue, Jersey City 4, N. J.

SMOOTH-ON

The amazing wood filler that accepts a stain, can be planed, power sanded and dries quickly!

For use in the home, on the farm, on the boat and in industry

A must in every woodworking shop!

NEWTON Mfg. Co., Inc.
45 Lowell St., Nashua, N.H.

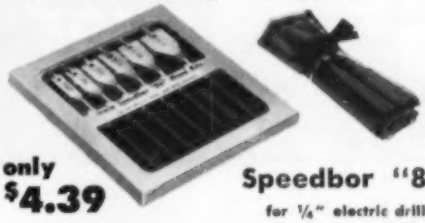
IRWIN

SANTA CLAUS SPECIALS

for the handy man, hobbyist, teen-age and professional woodworkers

No. DM(x) Borchest Set — **only $15.50**

13 Irwin original solid center auger bits, sizes ¼" to 1". Beautiful hand rubbed oak chest in Christmas box with colorful gift card and transparent lid. Patented spring-steel clips hold bits in place. Sizes shown for easy selection. Each bit hardened full length for longer life.



only $4.39 — **Speedbor "88"** for ¼" electric drills

Set of six in red plastic roll, sizes ⅜" to 1". Exclusive hollow ground point with spade-type cutters do more work with less power—in hard and soft woods, plaster, plastics, etc. Size markings on each bit. Hang-A-Bit Hole for easy storing on nail or pin.

No. 22(x) Micro-Dial Expansive Bit

only $3.15

It bores accurately from ⅞" up to 3". Change sizes with easy turn of a dial. Two cutters supplied with each bit. Drop forged from special bit steel, heat treated full length. A dependable all-purpose bit that does the work of complete set of individual sizes.

See Your Independent Hardware Dealer

IRWIN — **the original solid center auger bit** • **screw drivers, screw driver bits**
Wilmington, Ohio

IN INDUSTRY...

The grip, accuracy and durability of the Jacobs Plain Bearing Chuck have made it standard equipment all over the world. This model, especially designed for drill presses, features a Jacobs-engineered PLUS – the threaded locking collar for extra safety and more versatile use of the tool.

AND IN THE **HOME SHOP**

The Jacobs Plain Bearing Chuck equipped with threaded locking collar makes any drill press a safer, surer, more versatile tool.

Safer because the threaded collar keeps chuck locked on tapered spindle regardless of speeds or type of thrust.

Surer because it's a Jacobs, the most accurate, holdingest, longest lasting chuck of its kind – anywhere.

More versatile because it eliminates the necessity of using special collet chucks or similar adapters for holding routing, carving or dovetailing bits.

When you work with a drill press or portable electric tool you'll hold your drill or bit best when you use a Jacobs Chuck. There is none better for accuracy, grip and durability. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

Jacobs RUBBER-FLEX COLLETS

Jacobs CHUCKS

If it's a Jacobs—it holds

Car Hi-Fi Plays 16⅔-R.P.M. Records

[*Continued from page 132*]

against the fast pull of a bump. Its pivot—a simple shaft riding a bearing ball in a close-fitting hole—gets this uncanny ability from a silicone fluid. Silicones are those versatile chemicals that make bouncing putty, tough electrical insulation, waterproofing compounds and many other products. In this case, the silicone's odd habit of changing its viscosity is put to work. The silicone in the pivot hole is thin, permitting the pivot shaft to turn freely so long as the turning is slow. But try to turn the shaft quickly and the silicone becomes much more viscous, grabbing the shaft to retard its movement.

The cartridge—a special ceramic type—is not fastened directly to the tone arm, but rests on the end of a second arm that can swing up and down inside the horizontally swinging tone arm. This arm is counterweighted to balance on its pivot. With no weight on the needle, a spring forces it into gentle contact with the record: total pressure about 1/10 ounce.

What's on. Each player will come equipped with an assortment of six records—nine to 12 hours' listening. In this starting library is something for everybody: Tchaikovsky's *Pathetique* and Borodin's *Prince Igor, The Pajama Game* musical, *The Ballad of Davy Crockett*, romantic and jazz orchestral music, Cole Porter and Victor Herbert selections, and George Bernard Shaw's *Don Juan in Hell* recited by Charles Boyer, Cedric Hardwicke, Charles Laughton and Agnes Moorehead.

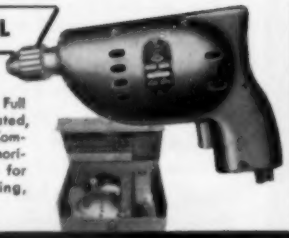
Columbia Records already has a catalogue listing 30 other selections on the 16⅔-r.p.m. discs. There are classical and popular orchestral music, musical comedy songs, dramatic readings and seven records for children.

Special car records are likely to come, though not in the works just yet. A keep-awake disc would be useful—it might ring a bell or whistle at you every so often, or maybe say sharply: "Wake up, mister! Time to pull over for coffee."

Records designed to amuse children

[*Continued on page 272*]

¼" ELECTRIC DRILL



One of the first and best home power tool investments. Full powered, permanently lubricated, drill in metal, wood, concrete. Complete Drill Tool set includes horizontal stand and accessories for polishing, sanding, sharpening, cleaning, buffing.

You'll Always Be Glad You Bought a SIOUX

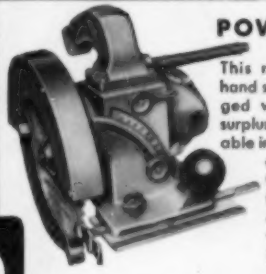
FLAT SANDER

Fast, powerful, light, dependable—orbital action. At 4,000 cycles per second produces fine finish on all woods, metals, fibres, etc., wherever hand sanding is usually employed.

The SIOUX name needs no introduction to the skilled mechanic who makes his living working with power tools. In the aircraft and automotive fields and in industry they're the tools the professionals have used for over 40 years!

WRITE FOR FREE CATALOG!

POWER SAW



This modern *SIOUX* hand saw is really rugged with a world of surplus power. Available in 8¼", 7½" and a 6½" Model that will saw through 2 x 4's at a 45° angle with plenty of blade to spare.

Mitre Cuts—Adjustable base for bevel cuts from 0 to 45°, to 1 15/16" depth. Spring lift with nut adjustment is quick, accurate.

Cross Cutting—Edge of base follows line. High speed makes it many times faster than hand sawing.

Rip Sawing—Adjustable rip scale guide is plainly graduated in fractions of an inch. Blower keeps line of cut free of saw dust.

ALBERTSON & CO., INC. • SIOUX CITY, IOWA

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- Properly Heat Treated
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- Polished Flats & Points
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Buy P&C today... the best tools money can buy. Shop from P&C Merchandisers, in over 10,000 stores.

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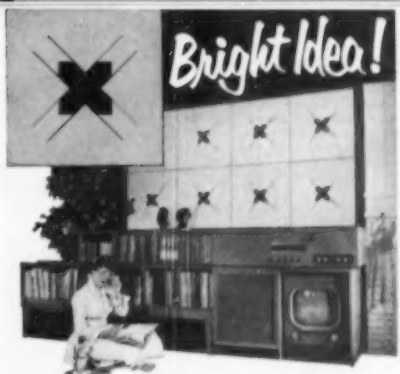
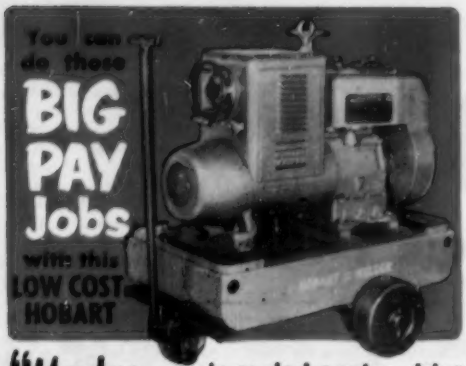
PORTLAND 22, OREGON



Moki® (RHYMES WITH O.K.) *with* **FIR PLYWOOD**

Exciting new way of decorating with fir plywood. Create bold, colorful designs by "weaving" slits in plywood with dowels or other inserts. Use for dramatic lighting effects, room dividers, fences, doors. Wonderful for remodeling, "do-it-yourself."

FREE BOOKLET—contains step-by-step instructions, ideas, design suggestions. See your lumber dealer or write (USA Only) Douglas Fir Plywood Association, Dept 1111 Tacoma 2, Wash.



"Husky Boy" arc welder air-cooled engine drive

Welds Anywhere!
In or out of the shop, the "Husky Boy" can earn bigger profits for you. And you save more on the purchase cost. Lighter weight makes it ideal for using on small service truck for quick emergency calls.
For use in the shop, wheels and handles are available at a slight additional cost.

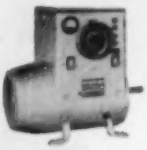
Full 200 amps. (not skimped)
Specially built for smaller shops requiring lighter weight and lower investment, the "Bantam Champ" gives full 200 amp.

You can "Build Your Own"
You can save even more by "Building Your Own" with this Hobart generator. Just connect the "Build-Your-Own" to your own used auto engine . . . it's perfect for small operations which do not justify a complete, factory built outfit.

AC Welder with AC Power for tools
The AC-AC Welder and Power Unit lets you do numerous repair jobs where no power is available . . . also furnishes emergency power for electric lights and power tools. 200 or 300 amp. size plus 5KW AC power.

Check these Low investment HOBART welders too!

200 Ampere Bantam Champ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AC Transformer type
For improved AC welding performance. Operates on single phase 220 power lines.

Welding Lessons $1.00
Complete operator's training course. 200 pages fully illustrated.

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☐ Welding Lessons, $1.00
NAME_____
ADDRESS_____
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Car Hi-Fi Plays 16⅔-R.P.M. Records

[Continued from page 270]

on long trips are a possibility. There might also be travelogues; as you toured a region you could play a disc that spieled local history and sights.

The tiny records should last indefinitely. Test discs have been played hundreds of times without noticeable wear.

Why 16⅔? The new record speed is not really new. It has been used for years for the Talking Book records furnished to blind people. It was adopted for the car phonograph, says Dr. Peter Goldmark, CBS research chief who headed the development, mainly because of the very long playing time it would give with a small record. And this speed is about as low as you can go and still get faithful music reproduction, Dr. Goldmark adds. The player covers a range up to notes of 10,000 cycles, providing unusual fidelity for an automobile outfit.

The phonograph is the fruit of years of dreaming about recorded music in a car. Dr. Goldmark and his staff first envisioned a tape player, but slide-rule work convinced them that discs were more practical. The tape player never got beyond the paper stage.

What about home use? CBS has no plans for a 16⅔ attachment for home phonographs, Dr. Goldmark says, but he agrees that it might have advantages.

The small records make possible important savings on expensive raw materials, yet play so long that an automatic changer would not be essential. The player's ruggedness would also make it ideal for children's use; you can slide the tone arm across a record without damaging either record or pickup. END

Modest Cost Makes Uranium Precious-Metal Bargain

REFINED uranium metal for atomic-furnace fuel now costs only $20 a pound, the Atomic Energy Commission reveals. This makes it currently worth about twice its weight or four times its bulk in silver, and much cheaper than gold. Potentially a pound of uranium is equivalent in heat energy to 1,500 tons of coal, costing about $9,000.

This storage wall serves two rooms!

get complete detail drawings and easy-to-follow directions in

FREE PATTERN KIT 322

—along with the picture-packed booklet, "Enchanting Homes of Western Pines." Write for it to Western Pine Association, Dept. 322-L, Yeon Bldg., Portland 4, Oregon

The clean-cutting woods of the Western Pines* prove perfect for this well-organized storage wall. Built into an existing partition — or planned for a new home—it includes a wardrobe with shoe-rack, drop-leaf desk, shelves, cupboard and sports equipment cabinet.

The smooth surface and even grain of the Western Pines take all finishes well. You'll find these carefully selected, well-seasoned woods a joy to work—and economical, too. Your local lumber dealer will give you an estimate—see him soon!

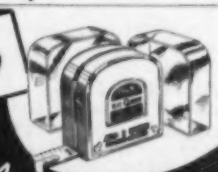
the Western Pines

- **IDAHO WHITE PINE**
- **PONDEROSA PINE**
- **SUGAR PINE**

HOME REPAIR TIP No. 21

WRAP ELECTRIC CORDS tightly, safely with "SCOTCH" Brand 33 Plastic Tape. Thin, tough tape stretches to conform, makes neat, permanent wrap. Use this long-wearing, waterproof tape to mend frayed cords, torn rainwear, too. "SCOTCH" 33 Plastic Tape—39¢ or 79¢ at stores everywhere. ©1955, Minnesota Mining and Manufacturing Co., St. Paul 6, Minn.

6-ft. only $1.49



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At your hardware store

EXCLUSIVE! Belt clip for handy carrying.
Also available in 8, 10, 12-ft. lengths with free plastic utility case.

INSULATE Right With ZONOLITE®

Says DANNY KAYE, star of "THE COURT JESTER"
Paramount comedy hit in VistaVision . . . color by Technicolor

You don't even have to be "handy" to insulate your own home in 4 miraculously short hours with Zonolite vermiculite insulating fill. Pour it, level it, *leave it!* Start saving immediately on fuel bills—Zonolite often pays for itself in two or three seasons. Rotproof, rodentproof, 100% fireproof. Guaranteed to outlast life of your home. Send coupon today.

as low as $67.60 insulates an average attic

DO IT YOURSELF In one afternoon . . save up to 40% on fuel bills

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Please rush me how-to-do-it free booklet HI-47 "Safety, Comfort, Savings in Your Home."

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TOPS FOR YOUR CHRISTMAS LIST . . .

to give or receive . . . here's a gift for year-'round use

WELLER POWER SANDER

Try your hand with this premium power sander. It's the most useful addition you can make to practical tools that get your work done faster and with results you'll be proud of.

The comfortable, compact design fits snugly in your hand. It responds perfectly to precision work, and it is practically impossible to stall.

Straight-line action sands with the grain, gives satin smooth finishes and flawless feathering with no bucking or twisting. Using a polishing cloth, the fast 14,400 strokes per minute give an expensive, high-gloss finish to any waxed surface. The Weller Sander-Polisher never needs lubrication.

COMPLETE WITH ASSORTED SANDING PAPER AND POLISHING CLOTH . . $14.95

Ask your Hardware Dealer for a demonstration or write direct for literature.

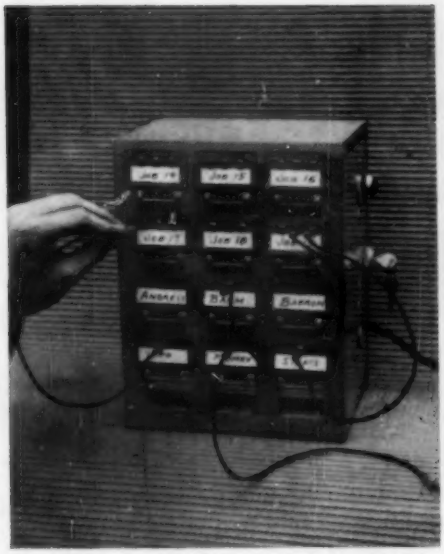
Weller **ELECTRIC CORP.**
806 Packer Street
Easton, Penna.

All Wool and a Ewe Wide

THIS ewe is all dressed up to keep her wool clean on dusty, windy rangeland. And come early shearing in chilly spring, the blanket will keep her warm. A zippered pleat in front takes up the slack left by the shorn wool. New Mexico sheepmen report that the blankets also "spook" coyotes, making them keep their distance.

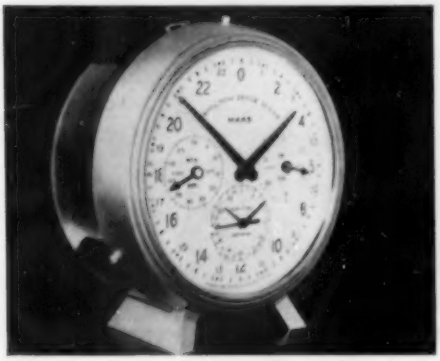
New Scope Sees Deep into Night

ARMY experts have beefed up the World War II sniperscope to pinpoint targets in total darkness at far greater range. Run by a battery pack worn by the rifleman, it bathes objects in its path in infrared rays to make them visible in the 20,000-volt telescopic image tube.



Man-Clock Keeps Job Accounts

EARL ALLGAIER'S Arlington, Va., shop devised this work analyzer to simplify cost and payroll accounting. When one of the six employees starts work, he plugs a jumper into a counter marked with his name and another bearing the job number. A timer then records the man-hours spent on each task. Several men can plug into one job.



Clock Ticks Off Time on Mars

HERE'S a clock made for tourists bound for Mars. The outer dial shows Martian time, the bottom dial earth time. Calendar dials tick off dates on the two planets. A year on Mars has 56-day months and each day lasts more than 24½ hours. Hamilton Watch built the clock for exhibitions.

MOST USEFUL GIFT TO GIVE OR RECEIVE . . .

WELLER SOLDERING KIT

with an instant-heat Soldering Gun

For hundreds of "do-it-yourself" jobs here's a tool you'll never part with once you try it. Perfectly balanced, pistol grip design fits your hand for instant action. Pull the trigger, full soldering heat and spotlights come on immediately . . . release, and they're off. No waiting, never any need to unplug.

Streamlined design slides easily into tight places and prefocused spotlights let you see what you are doing. Full, constant heat is maintained at the tip which is chisel-shape for maximum heat transfer.

Long-life tips last and last, and are easily and quickly replaced—only 50c for a package of 2. Special cutting and smoothing tips are available for dozens of extra jobs.

COMPLETE SOLDERING SET . . only $7.95

Weller 100 Watt Soldering Gun is supplied with famous Kester Solder, Soldering Brush, Weller Soldering Aid for making tight connections. Ask your Hardware Dealer for a demonstration or write direct for literature.

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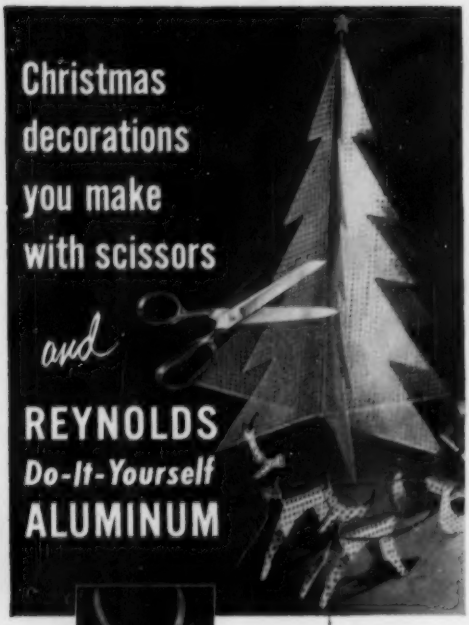

Ask for Plans Nos. 118 and 127. For Toys, Plan No. 119.

MAKING SHINING ALUMINUM DECORATIONS is great family fun. Amazingly easy to cut with ordinary household scissors. Use them outside or in – they can't rust or lose their luster. There's special fun for grown-ups in making strong, rustproof toys as wonderful Christmas morning surprises.

Your hardware or building supply dealer has Reynolds *Do-It-Yourself* Aluminum plus plans for these handsome Christmas projects.

Don't forget a good supply of Reynolds Do-It-Yourself Aluminum with power tool gifts

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Also available in Canada

Skyhook Lifts Rig Climbers

A DERRICKMAN's climbing weight is cut in half when he wears this counterbalanced safety belt. A cable fastened to his belt and to a counterweight (upper left) passes through a pulley at the top of the rig. Dykes, Inc., Houston, says tower workers ascend faster and easier with the Skyhook and feel fresher when they get to the top.

Prefab Nests Are for the Birds

TO LEARN more about the homing habits of swallows, Dr. Wilbur Mayhew of the University of California at Riverside will mass-produce bird homes. Next spring's nests will be cast from this master mold. They'll be just like the real thing except for remote-control doors to help Dr. Mayhew detain his guests for further study.

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88 illustrated pages, full of information and low prices on items for the home handyman. Everything from plywoods, lumber, veneers, mouldings and glues, to hardware and furniture trim; several pages of easy plans, lamp parts, metals and a section of bandings and inlays . . . not to mention the money saving $5 in discount coupons.

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SPECIFY YEAR, MAKE AND MODEL

INCLUDED—FREE OF CHARGE—OUR FAMOUS COURSE "How To Be A Successful Driver-Training Instructor"

Send Check, Money Order, F.O.B. Detroit
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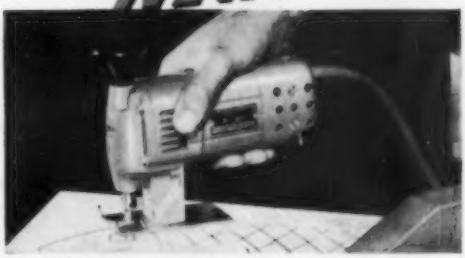
THEY'RE *NEW!*



FASTEST-CUTTING JIG SAW MADE! This powerful new Millers Falls tool is a jig saw, hack saw, coping saw, ripsaw, crosscut and keyhole saw all in one. Makes curved, straight or irregular cuts in wood, metal, all kinds of material—in places often inaccessible to other saws! Exclusive design features and special blades result in far greater cutting speed than any similar saw.

No. 480 Dyno-Mite Electric Jig Saw
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THEY'RE DYNO-MITE®

FOR THAT PROFESSIONAL FINISH! This new Millers Falls Orbital Sander finish-sands furniture, cabinets, interior trim . . . removes paint, varnish or surface imperfections . . . all without tracking, scoring or burning surface. High-speed orbital action permits sanding with or across the grain. Light weight makes it easy to use on overhead and vertical as well as horizontal surfaces.

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Finest Power Tools Made

MILLERS FALLS TOOLS

FREE AT YOUR HARDWARE DEALER'S
Ask for these folders on the whole power-packed line of Millers Falls Dyno-Mite electric tools including the remarkable new Dyno-Mite Power Workshop, or write direct.

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Mail this coupon for more information about easy-to-use Gold Bond Add-A-Room products.

MAIL COUPON TODAY

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Please send me my Gold Bond Add-A-Room Packet. Enclosed is 10¢ to cover mailing.

Name.....

Address.....

City.....*Zone*.....*County*.....*State*.....

Science Closes In on the Common Cold

[*Continued from page 139*]

They proceeded much as Dr. Salk had in making polio vaccine. First they grew the APC-3 virus in a culture made of kidney tissue from monkeys. Then they killed the virus with formaldehyde.

The result is known as a killed virus vaccine. Even though the virus in it is dead, the body marshals up antibodies to fight it.

From Hagerstown, the virus fighters moved to the federal reformatory at Chillicothe, Ohio, for a formal trial of the vaccine. First they took a blood sample from each volunteer and added it to a tissue culture in which the virus was growing.

In a third of the cases, growth stopped. This meant the men already had antibodies in their blood: they had encountered this virus before and become immune.

Then the investigators divided the susceptible men into two groups, of roughly 50 inmates each, and gave one group a shot of vaccine and the other a shot of salt water. Four weeks later, using a little cotton swab, they placed APC-3 virus on the lower eyelids of everybody in both groups.

A few days after the virus inoculations, a man-made epidemic began sweeping through the Chillicothe volunteers. It took 90 percent of the men who had not received the real vaccine, only 20 percent of those who had.

Huebner feels good about those results, but he emphasizes the problems that must be overcome before a vaccine is ready for general use.

The most important stems from the fact that *eleven* APC viruses have come to light since Huebner started to track the common cold, and there may be more.

In the laboratory, all the APC viruses act very much alike. They attack tissues in a characteristic fashion. They are quickly killed by even moderate heat (about 130 degrees F.) but resist cold very well. Sulfa drugs and the antibiotics have no effect on them. Finally, as in

[**Continued on page 302**]

Now You Can Have The Right Screw

Southern's FREE SIZE-CHART ready for your shop

Get your chart of sizes and technical information and keep it handy. Know the exact screw your job calls for . . . Phillips or slotted.

"Extras" and "Specials" in regular stock at regular prices. All Southern Screws USA-made to USA specifications, or better!

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Shark Brand Swedish Chisels

Make Your job easier.

You'll do neater, more accurate woodworking with SHARK BRAND SWEDISH CHARCOAL STEEL paring chisels . . . hold their sharpness 3 times longer than ordinary chisels.

Write for new folder Dept. PS

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DIVISION OF SANDVIK STEEL, INC.
1702 NEVINS RD., FAIR LAWN, N. J.

Building a scooter or midget racer? Need a new engine on your lawnmower? Best power for ANY job within their range is one of these newest Red Seals. Greater piston displacement, for power in excess of rating—plus more "lug" at low speeds, eliminating stalls. Exclusive Contex ignition system speeds and simplifies adjustment, doubles life of points and plug, and low oil level ignition cutoff ends hazards of running dry. 14 rugged models, horizontal and vertical shaft. Write TODAY for name of Red Seal dealer nearest you.

AH Series Horizontal Shaft

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Continental Motors Corporation
INDUSTRIAL AIR-COOLED ENGINE DIVISION
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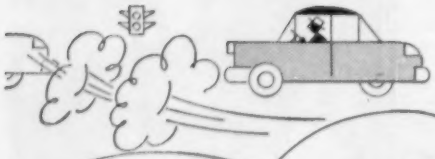
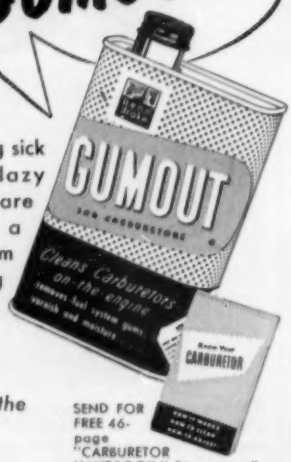
HOW TO ELIMINATE STALLING

LAZY PICK-UP



clean your carburetor with GUMOUT



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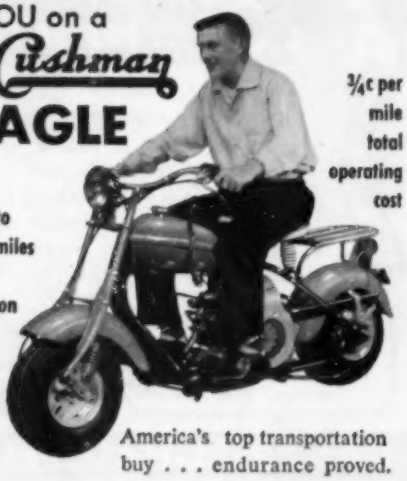

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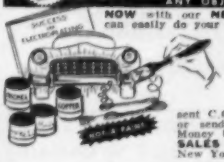

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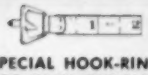

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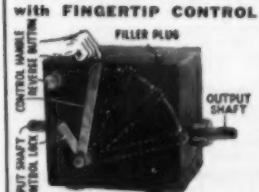

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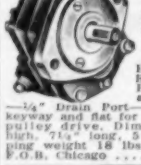

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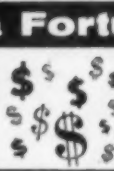

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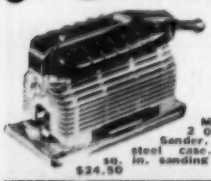

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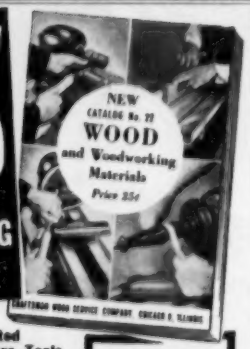

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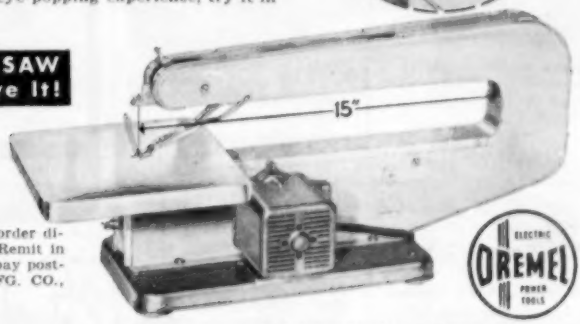

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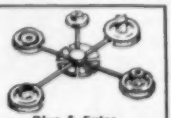

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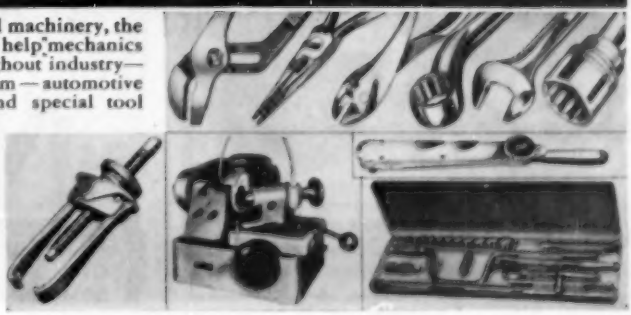

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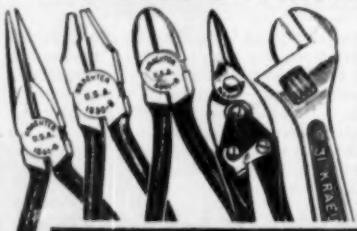

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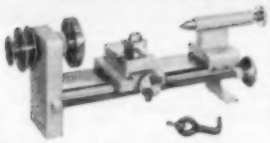

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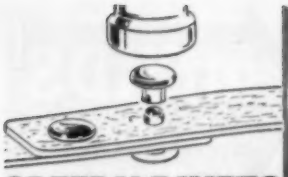

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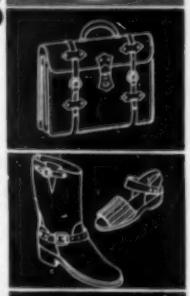

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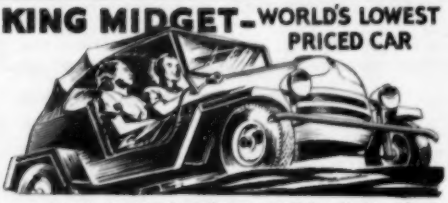

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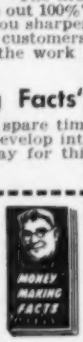

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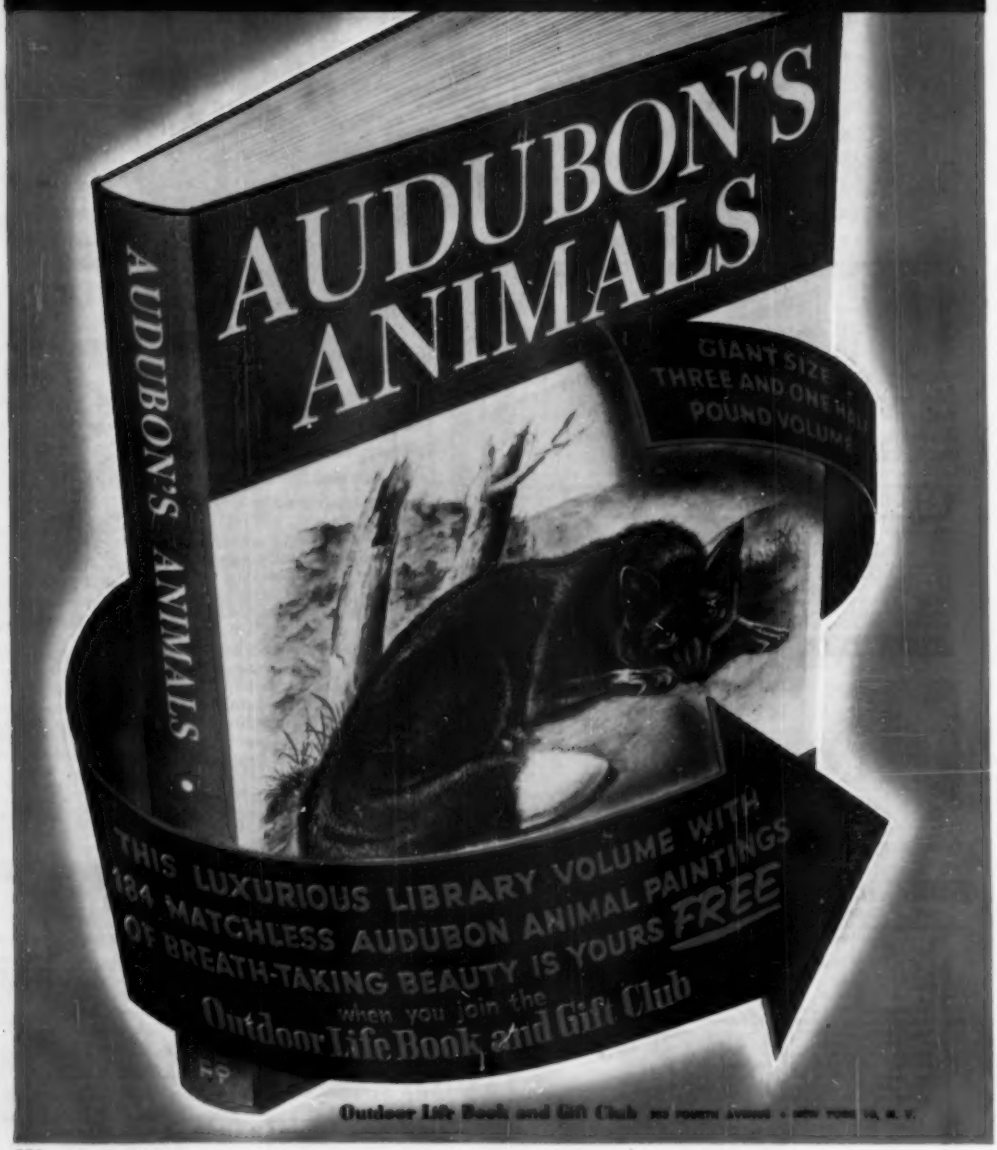

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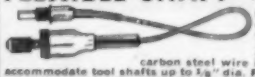

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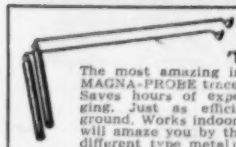

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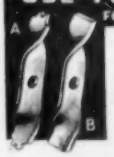

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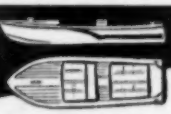

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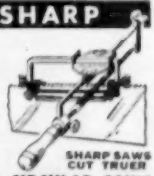

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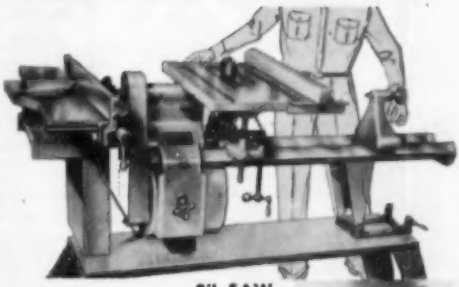

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- Capacity and performance of commercial saws selling from $60 to $250.
- Proved performance. Nationally advertised and sold for 8 years. Satisfied customers around the world.

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- 27x28 in. table, 13½ in. capacity in front of blade
- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees
- Floor model 34" high, table always stays level
- New Departure ball bearing arbor, ⅝" precision shaft turned down for ½" bore blades, aluminum housing, shipped ready to run.
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- Cast aluminum miter gauge and self-aligning rip fence guide

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- Cuts to center of 24 inch circle
- Handles stock up to 6 inches thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings; Upper wheel runs on two ⅝" bore Oilite Bronze bearings.
- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled
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- Rigid cast aluminum wheels fully machined ready-to-install. Heavy rubber tires
- Uses standard 78 inch blades up to ⅝ in. wide
- Fully enclosed mechanism for utmost safety

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Cutler-Hammer Floatswitch. Full size copper float. Rustproof pump body. 1" outlet with ½ HP Westinghouse Motor. If less motor Unit, is complete with all parts to take standard motor. Price complete less motor $15.00

$15.00 Less Motor
$29.50 With Motor

COMPLETE WATER SYSTEM

Automatic with Air control. Automatic pressure switch galvanized tank. Self-priming G.E. Motor. Enough water for average family. Can be installed in basement or under sink.

$59.95

Foot Valves—Check Valves—Plastic Pipe Couplings—Float Switches—Pump Blades—Shafts—Motors. Please give us complete details of your needs to save time.

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3400 RPM ½HP POWER SAW

RIPS - CROSSCUTS

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COMPARES TO SAWS SELLING UP TO $49.50

Only 19.98 Complete with 5-1/2" Blade

A rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has an adjustable (0 to 6") rip fence. Safety-trigger switch on handle. Full ½ HP Universal AC-DC, 110-120 Volt, 60 cycle motor. Weighs only 6½ lbs. Thousands already sold. Your satisfaction guaranteed.

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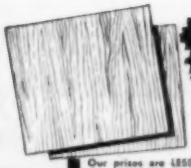

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1.79 PER SHEET	3.89 PER SHEET	4.99 PER SHEET
Minimum order 8 sheets	Min. order 6 sheets	Min. order 4 sheets

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Price per set of 4 with Brass tip.

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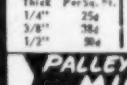
6"	3.00	2.65	16"	4.75	4.40
8"	3.55	3.00	18"	5.35	4.75
12"	3.95	3.55	28"	6.25	5.35

TRANSLUCENT FIBERGLASS PANELS



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Save on Manufacturer's Surplus and Closeouts! Top Quality. Ideal for Nooks, Chairs, Beds, Patio, etc. Add 75¢ cutting charge on ALL orders under $5.00.

SLAB STOCK

Smooth both sides. A solid but spongy material. Ideal for all types of pads.

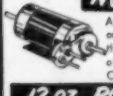
Thick	Per Sq. Ft.	Thick	Per Sq. Ft.
1/4"	25¢	3/4"	75¢
3/8"	38¢	1"	$1.00
1/2"	50¢	1-1/4"	1.25

CORED STOCK

Smooth on top and cored on the bottom, for maximum resilience.

Thick	Per Sq. Ft.	Thick	Per Sq. Ft.
1-1/2"	$1.00	3"	$2.60
2"	1.50	4"	3.00
2-1/2"	1.90	6-1/2"	5.20

NEW 4-SPEED HOBBY MOTOR



A rugged, precision built electric motor – operates on 110 volt, 60 cycle current. Originally built for the Navy – NOW converted for YOU! Has four take-off shafts turning at 5, 25, 150 and 4000 RPM. Cost Government approximately $35.00 NOW. 9.95

12 OZ. PORTABLE STOVE FOR HUNTER-HIKER-ETC.

Smallest, most compact, yet entirely practical cooking stove you've ever seen. NO PUMPING – NO PRIMING necessary – entirely self-generating. Has collapsible grill for frying pan or coffee pot. Burns 2-1/2 hours on one filling of regular gas. ALL BRASS construction. Weighs 12ozs. Ideal for Prospector, Camper, Hiker, Picnic, etc. Guaranteed 1 year. 3.98

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An Ideal Xmas Gift for the Student, Amateur Scientist, etc. Study insects, plant life, plant tissue, etc. Has fine ground and polished lenses. Precision ALL-METAL construction – this is NOT A TOY! The triple, revolving objective lens turret will allow you to select 100X – 200X or 300 power magnification. Has right or left hand rack & pinion adjustment for smooth, precise movement. Body inclines 90°. Adjustable plano sub-stage mirror. Complete in sturdy, dovetailed hardwood case.

Guaranteed 1 YEAR

ONLY 8.95

ARMY PICMATTOCK

Small, easy to use. Has a 12" steel head with a Mattock on one side and a Pick on the other. Has a 16½" hardwood handle. With canvas case. NEW 1.29

BOLO KNIFE & CASE

Made of top quality Vanadium steel. 15" long. Ideal for clearing brush. With sturdy belt sheath. 1.98

ARMY MACHETTE

NEW

Has 22" Vanadium steel blade. A hardwood handle. Sturdy belt sheath. 27" overall . . . ONLY 1.98

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WITH HEADSET ONLY 3.95

Here's a COMPLETE RADIO RECEIVER that picks up STANDARD BROADCAST STATIONS without using batteries or electricity! Just plug in the headset, antenna and ground wires and tune in your favorite program. You'll be amazed at the STRONG, CLEAR SIGNAL. Has a 100KC tuning range. Comes complete with Receiver, Antenna and Ground wires plus a Headset with two 2000 Ohm ear phones. NOT A TOY – A Genuine Crystal Receiver!

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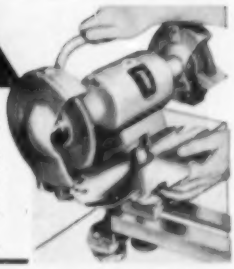
with New Foley Grinder Start your own sharpening business in your basement or garage with this new low-cost Foley "314" Grinder. Make up to $3 or $5 an hour in spare time. "314" does fast, precision work sharpening circular saws up to 44 inches diameter; dado heads, rotary power lawn mower blades, ice skates, scissors, sharp edged tools. Also does sanding, buffing, polishing. Easy to operate—no experience needed. Send postcard today for free literature on big-value, low-cost "314". No salesman will call—we sell only by mail.



FOLEY MFG. CO., 1176-5 Foley Bldg., Minneapolis 18, Minn.

[*Continued from page 278*]

the case of the common cold, they don't make laboratory animals sick.

Despite these similarities, the APC viruses are distinct types, and a vaccine for one does not affect the others.

What kind of sickness do they cause?

In the case of five of them, doctors don't know. They have been isolated only once or twice and are still among the "orphan viruses": those not yet certainly connected with any disease.

The other six cause fever and sore throat, plus, in many cases, red and watery eyes. Types 1, 2 and 5 seem to affect young children mostly. The great majority of reformatory volunteers tested by Huebner had developed immunity to these three and most other adults are probably immune, too. Several people in Huebner's lab, however, have picked them up, and he has had 3 and 4. The symptoms were much the same—sore eyes, sore throat, and slight fever.

On the basis of studies at the Army Medical School under Dr. Maurice Hilleman and by other research groups, including Huebner's, Type 4 is immediately important. This is because it has turned up in epidemics of what Army doctors call ARD—Acute Respiratory Disease—which are common among recruits.

Types 3 and 7 have also been found among recruits, so Huebner and his associates are now working on a multi-purpose vaccine intended to be effective against 4 and 7 as well as 3. The plan is to test it at certain Army camps this winter. At the best, a vaccine for general use, Huebner believes, is a year away.

Would such a vaccine end the menace of the common cold?

"What most people call a cold," Huebner points out, "may be any one of 25 or more different viruses, provided it isn't just an allergy. That explains why you can get a cold tomorrow, recover from it, and catch another next month.

"But some of the viruses associated with what is often called a cold have now been isolated, and tests have shown that we can produce a vaccine against at least one of them. We ought to be able to go on from there."

In sum, doctors don't know how to cure a "cold." The only proved treatment, as with other virus diseases, is rest. But they are whittling away at the block of viruses responsible, and they offer the hope that one day you will be able to take shots of several multi-purpose vaccines and win protection that may last for years. END

NEXT MONTH . . .

Further Adventures of TV's Gus Wilson

ART MARGOLIS' anecdotes about his experiences as a TV serviceman are rapidly making him as famous in his field as Gus Wilson is among auto mechanics.

You'll find some of his best stories yet in the December issue of POPULAR SCIENCE MONTHLY. He'll tell you then about his adventures in extending the lives of television tubes that had seemed about ready for the junk heap. Margolis articles that you'll remember from previous issues have included "Why TV Condensers Give Up the Ghost" and "8 Strange Tales of TV Antenna Troubles."

PORTABLE LIGHT PLANTS

1300-1500 WATT PLANT
115v. 60 cyc. AC Push Button Start. Powered by a 3½ HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22). Wt. 110 lbs. Reg. $475 value. Factory price... **$239.50**

1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery charging built-in! Factory price.. **$279.50**

MASTER-LITE 2500 Watt Plant 110/120 v. 60 cyc. AC. Powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00 (Item 21) Factory Price **$329.50**

(Item 21)

3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33⅓ more capacity. Wt. 270 lbs. Reg. $760. Factory Price..... **$379.50**

DUAL VOLTAGE 110/220 for any of above plants—$30 additional

get MASTER MECHANIC'S BEDROCK FACTORY PRICES

(Item 24)

600-700 WATT PLANT

PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2 HP. easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Regular $275.00 value..... **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output..... **$199.50**

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GIANT 2000-2500 WATT PLANT
110-120 v. 60 cyc. AC, absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price $585. Special at..... **$299.50**
Same plant with electric self starter (Item 31a)..... **$359.50**
Generator only and control box.... **$169.50**
DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.

DIESEL LIGHT PLANT
(Item 1660) Diesel Master—11-12 kw. 110/220 v. AC single or 3 phase. 1800 rpm direct connected. Electric Self-starting. Engineered for permanent power where continuous low-cost, heavy duty service is important. Wt. 1350 lb.

(Item 1660)

Reg. list $3650.00 Factory Price..... **$1895.00**
GAS DRIVEN PLANT. 10-11 kw 115-230 v. 60 cyc. AC, single or 3 phase, powered by 4 cylinder Wisconsin air cooled engine, Belt driven. Simple, reliable, 5 V-belt drive mounted on rugged steel skid. (Item 217) (with crank start) Wt. 900 lb. Factory price... **$1075.00**
Same plant with self-starter..... **$1145.00**

We make every type and size of light plant—Write, giving us your requirements!

52 pc. SOCKET SET

Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in ½" drive, ⅝" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job; in a big doghouse steel box. Wt. 17 lbs. (Item 205). List price $62.90. Factory Special..... **$27.95**

44 Pc. SOCKET SET
(Item 596) Same unconditionally guaranteed, non-breakable sockets as above. Complete range of 21 sockets from ¼" thru 7/16" (¼" drive) & 7/16" thru 1-1/16" (½" drive). Two extensions, reversible ½" ratchet, 3 drift punches, sliding "T" head, all angle coupling, ½" speeder, ½" breakover, 5 pc. high chrome alloy combination wrench set and 8 pc. offset wrench set in big doghouse tool box with ample room for other tools. Reg. $49.50. Wt. 16 lb..... **$21.95**

MASTER MECHANIC'S LIVE STEAM in 30 seconds from a cold start!

JET STEAM MASTER

The first portable, completely automatic steam generator ever offered at a real down to earth price. Produces live steam at 100 lbs. pressure in 30 seconds from a cold start! Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Develops large volume of high pressure steam on 2 pints of fuel oil—costs only 5c to clean an entire auto or tractor engine. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired, forced draft, built-in lifetime bronze water circulating pump. Uses water from standard hose outlet. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 462 Special factory price..... **$329.50**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Overrange removes kitchen smoke and odors. Powerful continuous duty motor. 110-120 v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM)

8" Pipe, wt. 5 lb.	$6.95
9" Pipe, wt. 6 lb.	$7.95
10" Pipe, wt. 7 lb.	$8.95
12" Pipe, wt. 8 lb.	$9.95
HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E)	$11.95
12" Fan, wt. 10 lbs. (Item 10D)	$12.95

EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable, 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **$8.95**

No. 10-2 POWER CABLE. Heavy duty, very flexible, rubber covered, 50 ft. with male and female fittings. Wt. 9 lbs. (Item 592a) **$10.45**
50 ft. without fittings (Item 592)... **$9.45**
NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. $6.95. 100 ft. (Item 200)..... **$12.95**

MASTER DC ARC WELDERS

(Item 280)

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to ¼" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 28a.) Wt. 110 lbs. $450 value. **$119.50**

WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) Wt. 110 lbs. $420 value. Special.. **$99.75**

COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200. Factory Special..... **$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **$10.50**

HI-FLO Centrifugal PUMP

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min.! . . . Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Prelubricated sealed bearings for years of heavy low cost service. **Big 1½" Model.** Item 502. Wt. 70 lbs. Factory price **$134.50**

CONDITIONAIRE VENTILATING FANS

Save big money installing your own exhaust fan. Efficient propellor type blade moves huge volume of air quietly and effortlessly. Heavy welded frame — predrilled for easy installation, just cut opening and bolt in place. Continuous duty motors. Ideal for attics, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.

Blade Opening	CFM	Wt.	Item	
16"	18¼"	2925	19 lb.	365a	$27.95
18"	19¼"	3600	27 lb.	365b	$31.95
20"	21¼"	4100	30 lb.	365c	$39.95

9 TON HYDRAULIC PRESS

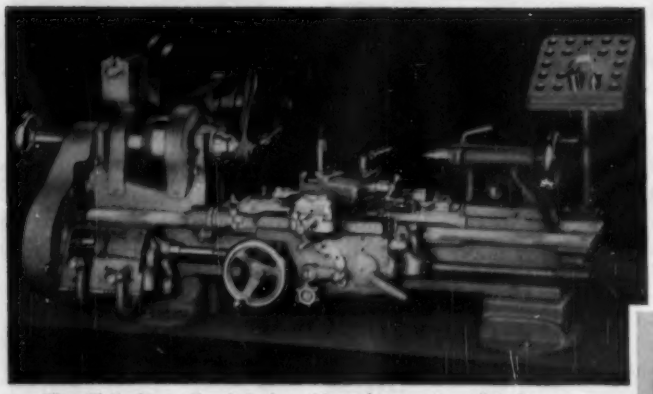
A tremendously powerful hydraulic press, capable of exerting 18,000 lbs. pressure. Pays for itself many times over—straightening bent connecting rods, king pins, crankshafts, axles, link pins and bars — or pushing out frozen bearings and bushings. Developed pressure under precise control and visible at all times on accurate gauge. Complete with both large and small anvils and jigs to straighten any kind of curve or bend. (Item 464) Wt. 110 lb. Actual list price $365. Our special close-out price..... **$69.50**

JET FLOW BLOWER

Tremendous air movement (1800 CFM) and quiet operation make this double inlet 10" turbine blower unsurpassable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with an ¼, ⅓ or ½ HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" hl x 18" x 16½". Outlet opening 13" x 11⅝". Wt. 45 lbs. Item 245. Reg. $54.50. Factory Special..... **$27.50**
HEAVY DUTY ¼ HP motor for above **$16.95**
12" TURBINE BLOWER Similar to above, but larger with 2400 CFM capacity. Wt. 65 lbs. (Item 245a) Reg. $70.00. Factory Spec. **$34.50**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for ... BIG 1955 Catalog

MASTER MECHANIC MFG. CO., DEPT. 51-L **Burlington, Wis.**



9" x 3' Toolroom Bench Lathe with toolroom attachments, less electrical equipment, f.o.b. factory, $608

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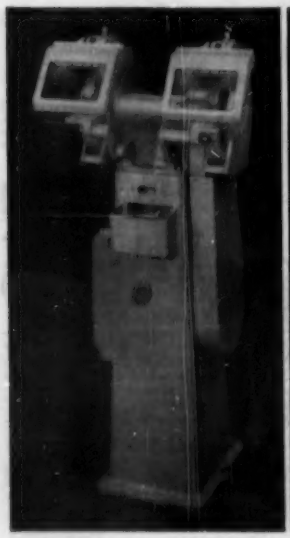

10" Pedestal Grinder with wheels and lights, but less motor, f.o.b. factory, $248

7" Bench Shaper with light, vise and pressure lubrication but less metal bench and motor, f.o.b. factory, $551

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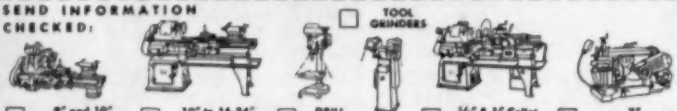

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ TOOL GRINDERS ☐ ½" & 1" Collet TURRET LATHES ☐ 7" BENCH SHAPERS

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NOW . . . Storm Windows need not cost you up to $14.00 apiece. American industry has developed a lightweight flexible product that enables you to seal out wintry blasts for only 49½¢ a window! Imagine it! For pennies per window you can insulate EVERY ROOM in your home! This new material was developed by the Gary plant of a billion-dollar American manufacturing firm—for use by the U.S. Government during the last war. It looks like glass, yet can't peel off, never chips, shatters or rattles. Actually flexible like rubber. Has a tensile strength of over one ton per square inch. Crystal clear, not milky or yellowish like some plastic materials. Weighs less than 1/10th of the lightest glass windows ever developed. Even a large window comes to less than 8 oz. Not affected by snow, sleet, rain or dampness—because it's 100% waterproof. Won't crack even at 53 degrees BELOW FREEZING! Use and re-use it YEAR AFTER YEAR for winter comfort and protection.

Sensational Discovery Used By Army To Fight Cold

One of the big problems of the last war was how to defend our troops and protect equipment against the ravages of Arctic winters. One of the world's greatest manufacturing companies was ordered to build a special plant and soon millions of yards of this new material was moving out to Alaska, the Aleutians, Iceland and Greenland. Finally, it was released to the public and ever since the demand has been greater than the supply! The Gary plant of famous REYNOLDS METALS COMPANY is working round-the-clock trying to supply it!

Use Year After Year—No Upkeep Cost!

At winter's end just fold away your Trans-Kleer like cloth for use next year. You can air the room anytime too—lift the Adheso border to let in fresh air, then press back and it's sealed tight again! Cleans easily with a damp rag. It's no wonder so many home owners, hospitals, churches and public buildings use this tried and tested REYNOLDS product! TRANS-KLEER comes in kits 36 inches by 432 inches and costs you only $4.95 complete with Adheso border! That is enough for 10 windows—each measuring 10.8 sq. ft.—just 49½¢ each! In all you receive 108 SQUARE FEET for only $4.95! Good GLASS storm windows cost from $7.95 to $16.00—for ten you'd have to pay $79 to $160.00. With this remarkable REYNOLDS product you not only save a terrific amount in the purchase price, you also cut down enormously on your fuel bills!

Install Trans-Kleer Windows in 5 Minutes

Trans-Kleer storm windows require no nails, hooks, screws or tools. No back-breaking toil or broken glass to contend with. Cut off required amount, trim to fit the inside of your window, large or small, square, round, rectangular—it makes no difference! Then press on the special Adheso border supplied and your storm window is firmly in place. Simple, easy—a child can install them.

Test In Your Home AT OUR RISK!

Here's your chance to get Trans-Kleer on a HOME TRIAL BASIS. You can't lose a single penny. Mail the coupon at right and a 36 by 432-inch kit—108 SQUARE FEET—will be shipped you immediately, complete with Adheso border. Deposit only $4.95 plus postage with the mailman. Try TWO windows inside any room. Test them—see for yourself how they seal out drafts. Compare the temperature—any 25¢ thermometer will do—compare with any other room in your home. See the difference—feel the difference! Then if you're not convinced they're every bit as effective as any storm window—why, just keep the TWO windows and return the balance and get your $4.95 back at once!

Just Lift Up For Airing

Trans-Kleer goes on quickly inside the window. To ventilate just lift the Adheso border. You may then open the storm window as much as you wish. Press back and you have perfect sealed-in insulation again. (See picture.) The special Adheso borders supplied with the Trans-Kleer windows will not lose their adhesiveness even if you air the rooms daily. They seal the Trans-Kleer to the frame snugly, tightly.

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Avoid Disappointment—Order Now!

Millions of folks in the U. S. and Canada are reading this same ad in hundreds of magazines and newspapers. Despite enormous production facilities, the REYNOLDS ALUMINUM people can turn out so much and no more! Don't wait until it's too late! Play safe! Rush the coupon NOW! If you wish to save postage cost, send check, cash or m. o. for $4.95 and the windows will be shipped postage free.

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RUSH . . . kits of Trans-Kleer measuring 108 sq. ft. each, enough for 10 windows averaging 10.8 sq. ft. each. Include improved Adheso Sealing Border and easy picture instructions at no extra cost. I will try 2 windows and if I'm not satisfied for any reason, I'll return the remainder within one week for FULL REFUND of my money. I will keep the 2 windows free.

☐ Payment enclosed. Send Prepaid.
☐ Send C.O.D. plus postage.

CHECK AMOUNT DESIRED

☐ 1 KIT (108 sq. ft.) for 10 windows—4.95 ☐ 2 KITS (216 sq. ft.) for 20 windows—8.95

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